AASHTO SUBCOMMITTEE ON MATERIALS
TECHNICAL SECTION 4C

COATINGS, PAINTS, PRESERVATIVES, BONDING AGENTS AND TRAFFIC MARKINGS

2009 MEETING, Anchorage, Alaska
THURSDAY, AUGUST 6, 2009, 8:00 A.M. TO 11:00 A.M.

AGENDA

I. Call to Order/Opening Remarks/General Business

II. Roster---Roll Call

AL		MT	Mat Strizich
CA	Phil Stolarski	NH	Alan Rawson, Chr.
CT	Ravi Chandran	NJ	Eileen Sheehy
GA	Rick Douds	PA	Tim Ramirez
IL	David Lippert	TN	Danny Lane
KS	Rick Kreider	UT	George Lukes
KY		VA	Bill Bailey
LA		VT	William Ahearn, V. Chr.
MA	Clement Fung	AMRL	Bob Lutz
MD	Woody Hood	AMRL	Katheryn Koretz
MO	Will Stalcup	AMRL	Ron Holsinger
MS	Mike O'Brien	FHWA	Dave Hall

Visitors:
AASHTO –
AMRL –
FHWA –
TRB/NCHRP –
Transportation Agencies –
Industry –

- TS4c Sign-In Sheet
- Requesting technical section membership.

III. Approve 2008 Technical Section 4c Minutes; Attachment 1

IV. Old Business

A) 2008 SOM Ballot Items

(1) Item 82: Adopt TP 65-03(2006), "Non-Instrumental Determination of Metallic Zinc in Zinc-Rich Primer" as a full standard (SOM Affirmative – 51, Negative – 0, No Vote – 1) (TS Affirmative – 16, Negative – 0, No Vote – 1)
Comments: Florida - No action required.

(2) **Item 83:** Adopt TP 66-06, "Analysis of Structural Steel Coatings for Hindered Amine Light Stabilizers (HALS)" as a full standard (SOM Affirmative – 51, Negative – 0, No Vote – 1)
(TS Affirmative – 16, Negative – 0, No Vote – 1)
Comments: Kansas **–** No action recommended; **see Attachment 2**.

(3) **Item 84:** Adopt TP 67-06, "Analysis of Structural Steel Coatings for Isocyanate Content" (SOM Affirmative – 51, Negatives – 0, No vote – 1)
(TS Affirmative – 16, Negative – 0, No Vote – 1)
Comment: Arkansas **-** Suggested resolution; **see Attachment 2**.

(4) **Item 85:** Revise M 284/M284M (SOM Affirm – 51, Negative – 0, No Vote – 1)
(TS Affirmative –16, Negative – 0, No Vote – 1)
Comments: Arizona & Illinois – Editorial; No action required.

(5) **Item 86:** Revise M 247 (SOM Affirmative – 51, Negative – 0, No Vote – 1)
(TS Affirmative – 16, Negatives – 0, No Vote – 1)
Comments: Washington & Pennsylvania
No action recommended; **see Attachment 2**.

(6) **Item 87:** R 31 (SOM Affirmative – 51, Negative – 0, No Vote – 1)
(TS Affirmative – 16, Negatives – 0, No Vote – 1)
Comments: Florida, Minnesota, New York, Kentucky, Texas, Arkansas, & Virginia **–** No action recommended; **see Attachment 2**.

(7) **Item 88:** Revise M 249 (SOM Affirmative – 50, Negative – 1, No Vote – 1)
(TS Affirmative – 15, Negatives – 1, No Vote – 1)
Comments: Texas & Virginia
Negative: Pennsylvania
Suggested resolution; Discuss negative at TS 4c meeting; **see Attachment 2**.

(8) **Item 89:** Revise M 247 (SOM Affirm – 51, Negative – 0, No Vote – 1) Ltr. Ballot
Comments: Minnesota, Washington & Virginia
Suggested resolution; Discuss MN comment TS 4c meeting; **see Attachment 2**.

(9) **Item 90:** Revise M 133 (SOM Affirmative – 50, Negative – 1, No Vote – 1)
(TS Affirmative – 15, Negatives – 1, No Vote – 1)
Comments: Illinois – No action required.
Negative: Mississippi
Suggested resolution; Recommend negative be found non-persuasive; **see Attachments 2 & 3.**

B) Technical Section Letter Ballots

TS Ballot 2009-1

(1) Reconfirmation M224-91 (2004) Use of Protective Sealers for Portland Cement Concrete. (TS Affirmative **–** 14; Negative – 1; No Vote – 0)

Negative: California
Suggested resolution; Recommend negative be found persuasive; **see Attachments 4 & 5.**

(2) Reconfirmation M233-86 (2004) Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.
(TS Affirmative **–** 14; Negative – 1; No Vote – 0)
Comments: New Hampshire & New Jersey
Negative: California
Suggested resolution; Recommend negative be found persuasive; **see Attachments 4 & 6.**

(3) Ballot for Reconfirmation T143-04 Sampling and Testing Calcium Chloride for Roads and Structural Applications.
(TS Affirmative **–** 15; Negative – 0; No Vote – 0)
No comments. No action required.

TS Ballot 2009-2

(1) Reconfirmation PP 55-06 (2006) Overcoating Field Test Program for Evaluating Protective Coatings on Existing Bridges or Salvaged Beams. .
(TS Affirmative **–** 17; Negative – 0; No Vote – 0)
No Comments. No action required.

TS Ballot 2009-3

(1) Revise M 133-10 Preservatives and Pressure Treatment Processes for Timber.
(TS Affirmative **–** 13; Negative – 3; No Vote – 3)
Negatives: Virginia, Pennsylvania & Kansas
Suggested resolution; Recommend negatives be found persuasive; **see Attachments 4,7, 8, & 9.**

C) Task Force Reports

(1) **Task Force 04A; Members**: Rick Krieder (KS) Chairman; Dave Kuniega (PA); Derrick Castle (KY); and Jason Davis (LA). Tasked with development of a uniform color standard for all striping materials.

- Status Update from Rick Krieder: NCHRP research has now been completed. For details go to: http://trb.org/news/blurb_detail.asp?id=8795

(2) **Task Force 04D Report;** Member: Greta Smith. Amend Existing Standards as a result of NCHRP Project 20-7/Task 113 (See 2004 Technical Section Minutes, Item 8.0). R31, Evaluation of Coating Systems with Zinc Rich Primers. Amend to include other uses of zinc such as metallizing and galvanization.

Derrick Castle, Chair NTPEP SCC is planning to continue the effort to

include metallizing and galvanizing in R31. Therefore, it is recommended that this Task Force be continued.

(3) **Task Force 04E Report;** Members: Keith Lane & Dave Hall. Amend Existing Minutes, Item 8.0). Amend M224, Use of Protective Sealers for Portland Cement Concrete. Consider including other sealers identified in Synthesis 209 as being used for Portland Cement Highway Facilities. Also need to include the impacts on future maintenance operations for various sealers. To meet this need, NCHRP Project 20-7, Task 235 was approved in November 2006 at the AASHTO Standing Committee on Highways Meeting. Dr. Amir Hanna is the project manager. Kelly Morse, Illinois DOT; Ed Collins, New York DOT; and William Real, New Hampshire DOT will be the research oversight team.

- Status Update; See TS 4C Research Update

(4) **Task Force 05A Report**; Members: Dave Kuniega (PA) Chairman; Greta Smith (KY). Develop guide that would include suggested acceptance criteria for R31 tests and include acceptance tests that are now included in the R31 appendix. This would permit specifying agencies an opportunity to assess the analytical ranges for verification of field samples and offer guidance for laboratory performance testing ranges that have been shown to provide acceptable field performance for various types of coatings. At the last three NEPCOAT meetings, steps have been taken to create acceptance ranges for paint systems. This includes acceptance ranges for % solids, viscosity, % pigment and wt/gal. While NTPEP has not engaged on this matter as yet, it is my understanding that they will have to, based upon the fact that a number of the early NTPEP systems are at the point of REAPPROVAL. The acceptance ranges initiated by NEPCOAT will be evaluated for appropriateness over the next couple of years before a recommendation will be made to NTPEP.

- Status Update from Dave Kuniega; NEPCOAT material property tolerances have been furnished to NTPEP Structural Steel Committee for their consideration. No further task force action is required.

(5) **Task Force 06A Report**; Chaired by Bill Bailey, Virginia, will develop wording to define varying climatic regions for outdoor exposure referenced in R31 **(Note: Field evaluations in various climatic regions has been delete from this standard in 08 version.)** and UV exposure referenced in the new standard PP55-06, "Overcoating Field Test Program for Evaluating Protective Coatings on Existing Bridges or Salvaged Beams."

- Status Update from Bill Bailey

(6) **Task Force 06C Report;** Chaired by Pennsylvania and assisted by Kansas and Vermont, will review sampling method for large quantities of glass beads referenced in M247. Potters and Flex-O-Lite will also be asked for input. Pennsylvania Test Method Proposed for Technical Section Ballot.

- Status Update from Tim Ramirez

(7) **Task Force 07A;** Will develop better definitions for M247 to define what constitutes a "transparent, clean, colorless glass" – Tim Ramirez (PA).

- Status Update from Tim Ramirez

(8) **Task force 07C;** Was established to review information presented regarding heavy metal testing of glass beads and make recommendations to the Technical Section. – Sheehy (NJ) chair, Ahearn (VT), Wolfe (AL), Hood (MD).

- Recommend no change to M247 until the New Jersey research on glass bead heavy metal worker exposure is complete.

(9) **Task Force 07E**; Alan Rawson will find volunteer state to draft up new AASHTO test method for coatings of glass beads and remove this method from the M247 specification.

- New Hampshire will draft for Technical Section Ballot.

(D) TS 4c On Going Research Update

(1) **NCHRP 20-7; Accelerated Wear Tester Feasibility Study & Scanning Trip to Spain**

- Update from Tom Baker (WA) (5 minutes)

(2) **NCHRP 20-7/ Task 243; Develop standard for optical sizing and roundness of glass beads.** The funding for the research lapsed and was reauthorized for $100,000. The original authorization was for $75,000. Dr. Haleh Azari of AMRL will be the principal investigator. Johnnie Miller, Texas DOT, David Kuniega, PennDOT, Christine Steuver, Florida DOT, and Alan Rawson, New Hampshire DOT and possibly Kansas and Oklahoma, will make up the Research Oversight Committee. Dr. Ed Hannigan is the Project Manager.

- Status Update: Presentation by Dr. Azari (20 minutes)

(3) **NCHRP 20-7/Task 255; Development of a Test Method to Determine the Ability of Adhesive Anchors to Resist Sustained Tensile Load.** The funding authorization for this project was $100,000. Dr. Ed Harrigan is the Project Manager. Dr. Ronald A. Cook of the University was selected as the as the Principal Investigator for this research.

- **Status Update: See final report and proposed standard; T XXX Evaluation of Adhesive Anchors in Concrete Under Sustained Loading Conditions (Attachments 10).**

(4) **NCHRP Project 20-7, Task 235; Consider appropriateness of sealers identified in Synthesis 209 for inclusion in M224.** Approved in November 2006 at the AASHTO Standing Committee on Highways Meeting. Dr. Amir Hanna is the project manager. Kelly Morse, Illinois DOT; Ed Collins, New York DOT; and William Real, New Hampshire DOT will be the research

oversight team. Also need to include the impacts on future maintenance operations for various sealers.

- Status Update: Dr. Hanna (5 minutes); Research complete.

V. New Business

A) Correspondence, calls, meetings/presentation by industry

(1) Request from Matt Mueller, Illinois (see Attachment 11).

(2) Presentation on AC 308; New evaluation criteria for adhesives and epoxy anchor products by John Silva, SE. Mr. Silva is the Director of Codes and Standards for Hilti North America (20 minutes).

B) Proposed new standards; T XXX Evaluation of Adhesive Anchors in Concrete Under Sustained Loading Conditions. (see Attachments 10)

C) Proposed new Task Force

(1) Provisional Standard Time Extension; None.

(2) Standards requiring reconfirmation in 2009:

(a) M 237-96 (2005) Epoxy resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement Concrete and Asphalt Concrete

(b) T 237-05 Testing Epoxy Resin Adhesive

(c) T 250-05 Thermoplastic Traffic Line Material

D) SOM ballot items (including any ASTM changes)

E) Research Needs

F) Other

(1) Technical Section 4c Standards Summary Sheet **(Attachment 12)**

VI. Adjourn

TECHNICAL SECTION 4C

ATTACHMENTS

AASHTO SUBCOMMITTEE ON MATERIALS
TECHNICAL SECTION 4C

COATINGS, PAINTS, PRESERVATIVES, BONDING AGENTS AND TRAFFIC MARKINGS

2008 MEETING, Asheville, North Carolina
THURSDAY, AUGUST 7, 2008, 9:00 A.M. TO 12:00 P.M.

Minutes

I. Call to Order/Opening Remarks/General Business

II. Roster---Roll Call

AL	Lynn Wolfe	Yes	MT	Oav Metcalfe (proxy for Mat Strizich)	Yes
CA	Phil Stolarski	No	NH	Alan Rawson, Chr.	Yes
CT	Ravi Chandran	No	NJ	Eileen Sheehy	No
GA	Rick Douds	Yes	PA	Tim Ramirez	Yes
IL	David Lippert	Yes	TN	Danny Lane	No
KS	Curt Niehaus (proxy for Rick Kreider)	Yes	UT	George Lukes	Yes
KY			VA	Bill Bailey	Yes
LA			VT	William Ahearn, V. Chr.	Yes
MA	Clement Fung	No	AMRL	Bob Lutz	Yes
MD	Woody Hood	Yes	FHWA	Dave Hall	Yes
MO	Will Stalcup	Yes			
MS	Mike O'Brien	Yes			

Visitors:

AASHTO – Henry Lacinak
AASHTO – Claire Kim
AMRL – Haleh Azari
FHWA – Paul Virmani
FHWA (ND) – Gary Goff
TRB/NCHRP – Amir Hanna

IL - Matt Mueller
NC – Niehdi Haeri
MS – James Williams
VA – Andy Babish
Rob Dingess – Mercer Strategic Alliance, Inc.
RW Anderson – Potters Industries
Kevin Goforth – Potters Industries
Ufuk Senturk – Potters Industries
Greg Goergrn – Osmose, Inc.
Joseph Wesner – Wesner Corporation
Rodney Powers – Rodney G. Powers & Associates
Vagn Askjaer – Flint

Dave Miller – MMFX Co

- TS4c Sign-In Sheet, see Appendix B (pg 134).
- Will Stalcup (MO) and George Lukes (UT) requested technical section membership.

III. Approve 2007 Technical Section 4c Minutes

Minutes were approved on a motion by AL seconded by IL; **Attachment 1** (pg 16)

IV. Old Business

A) 2007 SOM Ballot Items

(1) **Item 64:** Revise M284/M284M-06 (SOM Affirmative – 52, Negative – 0, No Vote – 0) (TS Affirmative – 16, Negative – 0, No Vote – 0)
SOM Comments: Idaho, Rhode Island, Pennsylvania
TS Comments: Pennsylvania
- Editorial Comments Addressed "08" Publication
- Non-Edit Comments: Suggested resolution; **Attachment 2 (**pg 25 & 152)

Approved concurrent ballot, on a motion by PA seconded by FHWA, for changes included in Attachment 2 to address PA comments regarding epoxy rebar repair requirements.

(2) **Item 65:** Revise M133-07 (SOM Affirmative – 50), Negative – 2, No Vote – 0) (TS Affirmative – 14, Negative – 2, No Vote – 0)
SOM Comments: Rhode Island
SOM Negatives: Pennsylvania, Kansas
TS Comments: None
TS Negatives: Pennsylvania, Kansas
- Non-Edit Comments & Neg: Suggested resolution; **Attachment 3** (pg 30)

Clarified scope. KS, PA negative votes were withdrawn based on clarification. No other action was recommended.

(3) **Item 66:** Revise M247-07 (SOM Affirmative – 50, Negatives – 2, No vote – 0) (TS Affirmative – 15, Negative – 1, No Vote – 0)
SOM Comment: Louisiana
SOM Negatives: Arkansas, Virginia
TS Comments: FHWA NH
TS Negative: Virginia
- Editorial Comments Addressed "08" Publication
- Non-Edit Com & Neg: Suggested resolution; **Attachment 4** (pg 33 & 155)

Established Task Force 2008-1 to address chemical resistance concerns expressed by ID. Alan Rawson will ask PA and ID to work with him to provide a recommendation on whether a chemical resistance test should be included in M247. Clarified that the 2007 SOM ballot inadvertently included a proposed draft to M247 from Potter's as part of the balloted changes. Based on the clarification VA had previously withdrawn their negative. AR had also withdrawn the portion of their negative that related to the Potter's draft. The balance of the AR negative was addressed by the changes proposed to M247 in attachment 4. Changes proposed in attachment 4 were approved for concurrent ballot on a motion by AL, seconded by VA.

(4) **Item 67:** Revise R31-06 (SOM Affirmative – 52, Negative – 0, No Vote – 0) (TS Affirmative – 16, Negative – 0, No Vote – 0)
SOM Comments: Maine, New York, Pennsylvania, Illinois
TS Comments: Pennsylvania

- Editorial Comments Addressed "08" Publication
- Non-Edit Com: Suggested resolution; **Attachment 5** (pg 43), **Balloted version - Attachment 5 Modified (**pg 163**)**

Comments from ME, NY, PA, and IL were reviewed by Derrick Castle (KY) resulting in the proposed changes to R31 shown in Attachment 5. Changes to R31, shown in Attachment 5, were approved for concurrent ballot on a motion by VA, seconded by IL. Motion by VA, seconded by PA, to include in the Attachment 5 concurrent ballot a requirement for the compositional testing of the single components for all multiple component coatings. Comments regarding base steel materials for test specimen production was referred back to KY for additional discussion/development.

(5) **Item 68:** Revise M249-07 (SOM Affirmative – 51, Negative – 1, No Vote – 0) **(**TS Affirmative – 16, Negatives – 0, No Vote – 0)
SOM Comments: Kentucky, New York, Virginia
SOM Negative: Arkansas
TS Comments: Kentucky, Virginia
Editorial Comments & Negative: Suggested resolution; **Attachment 6** (pg 71), **Balloted version - Attachment 6 Modified (**pg 185)

On a motion by VT, seconded by KS, Attachment 6, Section 3.1.5 was successfully amended such that "lead and" was added directly before lead-chromate. Amended Attachment 6 was approved for concurrent ballot on a motion by FHWA seconded by AL

B) Technical Section Letter Ballot

(1) TS Ballot 2007-2: Revise M247: Section 4.1 to add additional bead types (TS Affirmative **–** 18; Negative – 0; No Vote – 2)
TS Comments: Suggested resolution; **Attachment 7** (pg 78 & 191)

Changes to M247 shown in Attachment 7 were approved for letter ballot on a motion by AL, seconded by IL

C) Task Force Reports

(1) Task Force 99.1A; Proposed Revisions to M249
Members: Henry Lacinak, Chairman; Dave Kuniega; Lynn Wolfe; Vickie Prill
- Status update from Henry Lacinak - ASTM D04.38 Thermoplastic Task Group, chaired by Jerry Britt.

Established Task Force 2008-2 to perform an update to M249 after discussions revealed that ASTM D04.38 was developing their own thermoplastic standard rather than suggest changes to M249, as had been anticipated. TF chaired by Lyn Wolfe (AL) with members Jason Davis (LA), Dave Kuniega (PA) and Jim Swisher (VA). Industry representatives from major manufacturers to be invited Chris Davies (Potter), Susannah Dobbs (S-W Dobco), Jerry Britt (Ennis), Gary Ware (Swarco)

(2) Task Force 04A; Members: Rick Krieder (KS) Chairman; Dave Kuniega (PA); Derrick Castle (KY); and Jason Davis (LA). Tasked with development of a uniform color standard for all striping materials.

- Status Update from Rick Krieder

NCHRP report nearing publication

(3) Task Force 04D Report; Member: Greta Smith. Amend Existing Standards as a result of NCHRP Project 20-7/Task 113 (See 2004 Technical Section Minutes,

Item 8.0). R31, Evaluation of Coating Systems with Zinc Rich Primers. Amend to include other uses of zinc such as metallizing and galvanization.

R31 has been updated to allow non-zinc rich coatings to be qualified. Based on the SOM 07 ballot comment from Maine DOT, it is recommended that metallizing and galvanization not be added to R31. It is further recommended that the work of this task force be considered complete.

(4) **Task Force 04E Report;** Members: Keith Lane & Dave Hall. Amend Existing Standards as a result of NCHRP Project 20-7/Task 113 (See 2004 Technical Section Minutes, Item 8.0). Amend M224, Use of Protective Sealers for Portland Cement Concrete. Consider including other sealers identified in Synthesis 209 as being used for Portland Cement Highway Facilities. Also need to include the impacts on future maintenance operations for various sealers. To meet this need, NCHRP Project 20-7, Task 235 was approved in November 2006 at the AASHTO Standing Committee on Highways Meeting. Dr. Amir Hanna is the project manager. Kelly Morse, Illinois DOT; Ed Collins, New York DOT; and William Real, New Hampshire DOT will be the research oversight team.

- Status Update; See TS 4C Research Update

(5) **Task Force 05A Report**; Members: Dave Kuniega (PA) Chairman; Greta Smith (KY). Develop guide that would include suggested acceptance criteria for R31 tests and include acceptance tests that are now included in the R31 appendix. This would permit specifying agencies an opportunity to assess the analytical ranges for verification of field samples and offer guidance for laboratory performance testing ranges that have been shown to provide acceptable field performance for various types of coatings. At the last three NEPCOAT meetings, steps have been taken to create acceptance ranges for paint systems. This includes acceptance ranges for % solids, viscosity, % pigment and wt/gal. While NTPEP has not engaged on this matter as yet, it is my understanding that they will have to, based upon the fact that a number of the early NTPEP systems are at the point of REAPPROVAL. The acceptance ranges initiated by NEPCOAT will be evaluated for appropriateness over the next couple of years before a recommendation will be made to NTPEP.

- Status Update from Dave Kuniega

Discussion of need for standards setting in requalification process. No action taken

(6) Task Force 06A Report; Chaired by Bill Bailey, Virginia, will develop wording to define varying climatic regions for outdoor exposure referenced in R31 **(Note: Field evaluations in various climatic regions has been delete from this standard in 08 version.)** and UV exposure referenced in the new standard PP55-06, "Overcoating Field Test Program for Evaluating Protective Coatings on Existing Bridges or Salvaged Beams."

- Status Update from Bill Bailey

TF has developed categorizations for climatic conditions. TF is progressing towards goals.

(7) **Task Force 06B Report;** Chaired by Matt Mueller (IL) and assisted by Dave Hall (FHWA), will gather additional information to support proposed changes in M284. This task group will recommend the maximum coating thickness referenced in M284.

- Status Update from Dave Lippert

Task Force to be disbanded due to inability to arrive at a recommendation as a result of the complexity and liability issues associated with reconciling different design practices.

(8) **Task Force 06C Report;** Chaired by Pennsylvania and assisted by Kansas and Vermont, will review sampling method for large quantities of glass beads referenced in M247. Potters and Flex-O-Lite will also be asked for input. Pennsylvania Test Method Proposed for Technical Section Ballot.

- Status Update from Tim Ramirez

Task Force reports limited progress. A preliminary inquiry into sampling practices is being compiled.

(9) **Task Force 07A;** Will develop better definitions for M247 to define what constitutes a "transparent, clean, colorless glass" – Tim Ramirez (PA).

- Status Update from Tim Ramirez

(10) **Task force 07B;** Was established to review recommendations by Osmose to revise M133 – Krieder (KS) chair, Ahearn (VT), Douds (GA), Lacinak (LA)

Recommended addition of a second qualifying Agency. Changes to M133 shown in Attachment 8 were approved for concurrent ballot on a motion by VT, seconded by MS

- See recommendation Attachment 8 (pg 87 & 199)

(11) **Task force 07C;** Was established to review information presented regarding heavy metal testing of glass beads and make recommendations to the Technical Section. – Sheehy (NJ) chair, Ahearn (VT), Wolfe (AL), Hood (MD).

- Recommend no change to M247 until the New Jersey research on glass bead heavy metal worker exposure is complete or Task Force recommendation (Attachment 9 (pg 94**)).** Also see the letters from Potters Industries dated September 7, 2007 and July 18, 2008 **(Attachment 10 (**pg 102**)).**

Approved no action to be taken on a motion by VT, seconded by AL.

(12) **Task Force 07D;** Will prepare a draft revision to M247 to include specifications for larger glass beads currently designated as FHWA Type 3, 4, and 5 – Henry Lacinak.

- For task force recommendation see Attachment 7 (pg 78 & 191**).**

(13) **Task Force 07E**; Alan Rawson will find volunteer state to draft up new AASHTO test method for coatings of glass beads and remove this method from the M247 specification.

- New Hampshire will draft for Technical Section Ballot.

(D) TS 4c On Going Research Update

(1) NCHRP 20-7; Accelerated Wear Tester Feasibility Study & Scanning Trip to Spain

- Update from Tom Baker (WA)

(1) **NCHRP 20-7/ Task 243; Develop standard for optical sizing and roundness of glass beads.** The funding for the research lapsed and was reauthorized for $100,000. The original authorization was for $75,000. Dr. Haleh Azari of AMRL will be the principal investigator. Johnnie Miller, Texas DOT, David Kuniega, PennDOT, Christine Steuver, Florida DOT, and Alan Rawson, New Hampshire DOT and possibly Kansas and Oklahoma, will make up the Research Oversight Committee. Dr. Ed Hannigan is the Project Manager.

- Status Update: Dr. Azari and/or Dr. Hannigan

Work is progressing with identification of available manufacturers, preparation of standard sample materials and NDT by several methods to characterize the standard samples.

(2) **NCHRP 20-7/Task 255; Development of a Test Method to Determine the Ability of Adhesive Anchors to Resist Sustained Tensile Load.** The funding authorization for this project was $100,000. Dr. Ed Harrigan is the Project Manager. Dr. Ronald A. Cook of the University was selected as the as the Principal Investigator for this research.

Work is progressing nicely, preliminary draft likely in first quarter 2009. There are additional studies underway of substantially greater scope on the issue

- Status Update: Dr. Hannigan

(3) **NCHRP Project 20-7, Task 235; Consider appropriateness of sealers identified in Synthesis 209 for inclusion in M224.** Approved in November 2006 at the AASHTO Standing Committee on Highways Meeting. Dr. Amir Hanna is the project manager. Kelly Morse, Illinois DOT; Ed Collins, New York DOT; and William Real, New Hampshire DOT will be the research oversight team. Also need to include the impacts on future maintenance operations for various sealers.

Work is expected to competed this fall with changes to M224 being made available for consideration by TS 4c.

- Status Update: Dr. Hanna

V. New Business

A) Correspondence, calls, meetings/presentation by industry

(1) Potters Industry, Attachment 10 (pg 102)

B) **Proposed new standards;** None

C) Proposed new Task Force

D) (1) Provisional Standard Time Extension; None. See SOM Ballot Items.

(2) Standards requiring reconfirmation in 2008:

(a) M224-91 (2004) Use of Protective Sealers for Portland Cement Concrete

(b) **M233-86 (2004) Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete;** This standard in no longer VOC compliant for many states.

(c) T143-04 Sampling and Testing Calcium Chloride for Roads and Structural Applications

E) SOM ballot items (including any ASTM changes)

Approved a motion by IL, seconded by KS to send ballot items (1), (2) and (3) below to concurrent ballot**.** Items 4 through 9 approved for balloting under old business.

(1) T XXX – 08 Non-Instrumental Determination of Metallic Zinc in Zinc-Rich Primer; Formerly TP 65-03 (2006). Recommend SOM concurrent ballots as full standard **(Attachment 11 (**pg 136**)**

(2) T XXX – 08 Analysis of Structural Steel Coatings for Hindered Amine Light Stabilizers (HALS); Formerly TP 66-06. Recommend SOM concurrent ballot as a full standard **(Attachment 12 (**pg 142**)**.

(3) T XXX – 08 Analysis of Structural Steel Coatings for Isocyanate Content; Formerly TP 67-06**.** Recommend SOM concurrent ballot as a full standard **(Attachment 13 (**pg 147**)).**

(4) Revise M284/M284M; 07 SOM ballot resolution. Recommend SOM concurrent ballot **(Attachment 2 (**pg 152**)).** Approved for concurrent ballot.

(5) Revise M247; 07 SOM ballot resolution. Recommend SOM concurrent letter ballot **(Attachment 4 (**pg 155**)).** Approved for concurrent ballot.

(6) Revise R31; 07 SOM ballot resolution. Recommend SOM concurrent ballot (Attachment 5 Modified (pg 162)). Approved for concurrent ballot.

(7) **Revise M249;** 07 SOM ballot resolution. Recommend SOM concurrent ballot (Attachment 6 Modified (pg 185)). Approved for concurrent ballot.

(8) Revise M247; Adding additional bead sizes. Recommend SOM letter ballot (Attachment 7 (pg 191)). Approved for letter ballot.

(9) Revise M133; Adding International Code Council Evaluation. Recommend SOM concurrent ballot (Attachment 8 (pg 199)). Approved for letter ballot.

F) Research Needs

IL provided a sample specimen of an epoxy coating with texture. The coating thickness is slightly greater in addition to the observable texture. Preliminary testing showed increased adhesion and shorter development lengths for this coating. It was recommended for further investigation

because of potential savings in steel consumption, decreased corrosion and fewer coating holidays. Dave Halll from FHWA will contact the FHWA Resource Centers to determine an effective approach to promote full investigation of this new development.

G) Other

(1) Technical Section 4c Standards Summary Sheet **(Attachment 14 (**pg 133**))**

VI. Adjourn

Appendix A: Agenda

Appendix B: Roster

Appendix C: Ballot Items

(1) **TXXX – 08 Non-Instrumental Determination of Metallic Zinc in Zinc-Rich Primer**; Formerly TP 65-03 (2006). (Attachment 11 (pg 136)) Provisional to full standard.

(2) **TXXX – 08 Analysis of Structural Steel Coatings for Hindered Amine Light Stabilizers (HALS);** Formerly TP 66-06. (Attachment 12 (pg 142)) Provisional to full standard.

(3) **TXXX – 08 Analysis of Structural Steel Coatings for Isocyanate Content;** Formerly TP 67-06. (Attachment 13 (pg 147)) Provisional to full standard.

(4) **Revise M284/M284M; 07 SOM ballot resolution.** (Attachment 2 (pg 152))

(5) **Revise M247; 07 SOM ballot resolution**. (Attachment 4 (pg 155))

(6) **Revise R31; 07 SOM ballot resolution.** (Attachment 5-Modified (pg 162))

(7) **Revise M249; 07 SOM ballot resolution.** (Attachment 6-Modified (pg 185))

(8) **Revise M247**; Adding additional bead sizes. (Attachment 7 (pg 191))

(9) **Revise M133;** Adding International Code Council Evaluation. (Attachment 8 (pg 199))

Ballot Details	
Ballot Number	SOM-2008
Ballot Name	Subcommittee on Materials - 2008 Ballot
Ballot Manager	Jack Springer
Ballot Start Date	12/1/2008
Ballot Due Date	1/16/2009
Item Details	
Part Number	SOM-TS-4c
Part Title	Technical Section 4c
Item Number	**82 - No Action Required**
Item Description	Concurrent ballot item to adopt TP 65-03(2006), "Non-Instrumental Determination of Metallic Zinc in Zinc-Rich Primer" as a full standard. See page 136 of the minutes.
Affirmative 51 / 51 Votes	
Thomas O. Malerk - Florida Department of Transportation	Good method for analyzing zinc content.
Negative 0 / 51 Votes	
Item Number	**83 - No Action Recommended; See below comment from Derrick Castle**
Item Description	Concurrent ballot item to adopt TP 66-06, "Analysis of Structural Steel Coatings for Hindered Amine Light Stabilizers (HALS)" as a full standard. See page 142 of the minutes
Affirmative 51 / 51 Votes	
Rick Kreider - Kansas Department of Transportation	3.1 ...See Table 1 as a guide for initial instrument conditions. I thought this was a standard test method, not a guide. Is it not ready for full standard? **This document is proposed to be adopted as a standard. The language in 3.1 and the referenced table are intended to be used as starting points for the instrumental analyses. Realizing not every laboratory will utilize the same make and model of GC, the set point parameters may need to be modified to achieve the best possible separation and identification of compounds (HALS).**
Negative 0 / 51 Votes	
Item Number	**84 - Recommend action provided by Derrick Castle**
Item Description	Concurrent ballot item to adopt TP 67-06, "Analysis of Structural Steel Coatings for Isocyanate Content" as a full standard. See page 147 of the minutes.
Affirmative 51 / 51 Votes	
Michael C. Benson - Arkansas State Highway and Transportation Dept	Item 84: TP 67-06 Use of NCO (the functional group of atoms) for the isocyanate group in the text of the document would be clearer if it was also included in Section 1.1 (such as â€œisocyanate (NCO) contentâ€) or as a note in the document. **Recommend adding “NCO” in Section 1.1 as stated. Also recommend replacing “NCO” with “isocyanate” throughout the text of the document with the exception of the actual calculation formula in 5.2.**
Negative 0 / 51 Votes	
Item Number	**85 - Editorial; Corrected 29th edition.**
Item Description	Concurrent ballot item to revise M 284/M284M. See page 152 of the minutes.
Affirmative 51 / 51 Votes	

James Delton - Arizona Department of Transportation	The entire specification is incorrectly right justified**. Editorial**
David Lippert - Illinois Department of Transportation	(Epoxy Coated Rebars) **Comment is unclear.**
Negative 0 / 51 Votes	
Item Number	**86 - Suggested action provided below.**
Item Description	Concurrent ballot item to revise M 247. See page 155 of the minutes.
Affirmative 51 / 51 Votes	
Thomas E. Baker - Washington State Department of Transportation	The proposed changes are to clarify use of dansyl chloride when testing coating and to add acceptance requirement regarding flow of beads. However, there is another ballot # 89 for the same AASHTO designation that proposes different title, additional types for beads and subsequent change in numbering system for this standard. Suggest that ballot #86 and ballot #89 be combined to reflect simultaneously the proposed changes. **Ballot item #86 addressed 2007 ballot comments. Ballot item #89 addressed the addition of new bead sizes. Both ballot items passed. A second balloting of these changes in a combined ballot is not recommended.**
Jeff Seiders - Texas Department of Transportation	ASTM D1214 and D1155 are the referee testing standards for gradation and roundness when utilizing other testing methods, however these two methods are less precise and less accurate than some of the other available methods - the referee method should be much more precise and accurate than these two methods, even if it means that only a highly specialized lab (like NIST) can perform the testing. **ASTM D1214 and D1155 are the current recognized standards. This issue should be revisited once there is a wider acceptance of the more precise methods. No action is recommended at this time.**
James Delton - Arizona Department of Transportation	The entire specification is incorrectly right justified. **Editorial; Corrected 29th edition.**
Andy Babish - Virginia Department of Transportation	Comments: Section 1.3.3 need last r on purchaser **Editorial; Corrected 29th edition.**
Negative 0 / 51 Votes	
Item Number	**87 – Suggested action provide below.**
Item Description	Concurrent ballot item to revise R 31. See page 162 of the minutes.
Affirmative 51 / 51 Votes	
Thomas O. Malerk - Florida Department of Transportation	AASHTO/NTPEP needs to come to a concensus on requalification of materials. It seems different committees are approaching this differently. **Comment provided to Derrick Castle, NTPEP SSC Chair. No further action required.**

Keith Shannon - Minnesota Department of Transportation	Yes, work needs to be done for evaluation of duplex coatings that include galvanizing as primer. **Comment provided to Derrick Castle, NTPEP SSC Chair. No further action required.**
Robert L. Sack - New York Department of Transportation	The proposed change to a referrence in Section 9.7.4 from EPA SW 846 to EPA SWA 846 is incorrect. SW 846 is also referrenced in section 2.1.3 (with no A or a proposed change to SWA in the ballot) and it is a critical reference. We are not aware of any SWA 846. **The proposed change was requested through a previous review. After some research EPA SW 846 does appear to be the correct reference. Please revise all references to EPA SW 846. Editorial; Needs to be corrected in 30th edition. Comment provide by Derrick Castle.**
Allen Myers - Kentucky Transportation Cabinet	Much work has gone into the continued development of AASHTO R 31 to broaden the scope of the document. We would much prefer to continue this effort and further revise AASHTO R 31 to be acceptable for evaluation of hot-dip galvanizing and metallizing rather than begin to exclude these types of coatings. **I would prefer to not exclude systems for metalizing and galvanizing. I would prefer to establish a small group within NTPEP and 4C to draft necessary changes and provisions for appropriate testing of these systems. Comment provide by Derrick Castle, NTPEP SSC Chair. No action required**
Jeff Seiders - Texas Department of Transportation	It should be clearly stated that all test panels, both laboratory testing and marine exposure, should be prepared at the same time from the same batch of materials to minimize the influence of batch variations on the test results. **Consider renumbering and adding the following: 8.2.6 Test panels shall be coated in a single scheduled system application from single production batches of products. Recommendation provide by Derrick Castle.**
Michael C. Benson - Arkansas State Highway and Transportation Dept	Item 87: R 31 Modification of the drying times reported in R 31 to include those required by M 300 would seem to be appropriate.
Andy Babish - Virginia Department of Transportation	Comments: Section 8.25- Need the last r in manufacturer Section 9.3.2 This should be Illuminant D65 rather tha Illuminate D65? **Editorial; Corrected 29th edition.** Section 9.7.1.1 For FTIR, is the KBr sandwich technique preferable to the ATR technique? **The IR methods referenced were the recommended methods during the development of the program. The Technical Committee is in the process of designing a round robin test to evaluate a number of IR methods (including ATR/HATR) to determine precision and bias over a spectrum of generic coating types. The end result is to generate data to support any proposed changes to IR testing and to develop precision statements for any IR method utilized. Comment provide by Derrick Castle, NTPEP SCC chair. No action required at this time.**
Negative 0/51 Votes	
Item Number	**88**

Item Description	Concurrent ballot item to revise M 249. See page 185 of the minutes.
Affirmative 50/51 Votes	
Jeff Seiders - Texas Department of Transportation	3.1.5 would be better served reading as: "Yellow pigment lead 'OR' lead-chromate free. **No action recommended.**
Andy Babish - Virginia Department of Transportation	Comments: Section 3.1.5 Need to define lead free and chromate free**.** **Agree, suggestions for test methods and limits please. Comment provide by Derrick Castle.** Section 4.3.2- Allows longer to dry at a higher temp?? **Material is classified as a thermoplastic resin system. The material becomes fluid at elevated temperatures. The material must dissipate heat to change from fluid to solid form. Application to an elevated surface temperature will retard heat dissipation from the material and therefore extend the time to set (solidification). Comment by Derrick Castle. No action recommended.**
Negative 1/51 Vote	
Timothy Ramirez - Pennsylvania Department of Transportation	Section 3.1.5 - Does lead & lead chromate free mean 0 ppm, 0 ppb or some other limit? What test method will be required for analysis? **Typically lead or chromate free does not equal 0%, ppm, or ppb content. Lead or chromate free generally implies constituents may be present below regulatory or instrumental detection limits. It would make sense to cite the regulatory exposure limits set by OSHA for lead and chromium as a starting point and use the approved test methods cited as well, typically Atomic Absorption either flame or ICP. Comment by Derrick Castle. Discuss at TS 4c meeting.**
Item Number	**89**
Item Description	SOM letter ballot item to revise M 247. See page 191 of the minutes.
Affirmative 51/51 Votes	
Keith Shannon - Minnesota Department of Transportation	Yes, Table 1 should show dual units for sieve sizes. ASTM uses both units and still maintains SI status when dealing with sieve analysis. **Dual units can be added if people feel it is necessary. ASTM E11 has English sizes that equate to gauge sizes. Comment provided by Dave Kuniega. Discuss at TS 4c meeting.**
Thomas E. Baker - Washington State Department of Transportation	The proposed changes are to clarify use of dansyl chloride when testing coating and to add acceptance requirement regarding flow of beads. However, there is another ballot # 89 for the same AASHTO designation that proposes different title, additional types for beads and subsequent change in numbering system for this standard. Suggest that ballot #86 and ballot #89 be combined to reflect simultaneously the proposed changes. **Ballot item #86 addressed 2007 ballot comments. Ballot item #89 addressed the addition of new bead sizes. Both ballot items passed. A second balloting of these changes in a combined ballot is not recommended.**

Andy Babish - Virginia Department of Transportation	Editorial Comments: Section 1.3.3 need last r on purchaser. Section 5.1 - Insert "(2 lbs)" behind 1 kg in second sentence as other metric weights are referenced in lbs. **Editorial; Corrected in the 29th edition.**
Negative 0 / 51 Votes	
Item Number	**90**
Item Description	Concurrent ballot item to revise M 133. See page 199 of the minutes.
Affirmative 50 / 51 Votes	
David Lippert - Illinois Department of Transportation	Pres. for Timber **Comment unclear.**
Negative 1 / 51 Vote	
James Williams - Mississippi Department of Transportation	Creating a dual set of standards for acceptance of treated wood products will be difficult for State Agencies to manage. **Recommend negative be found non-persuasive. See rationale provided in 2008 SOM Ballot (attachment).**

Close

Rationale for Proposing Revisions to M133-09

Historically, AASHTO Standard Specification M133 for Preservatives and Pressure Treatment Processes for Timber have been based on preservative systems standardized by the AWPA. Over the last several years there have been changes in the wood preservation industry with the introduction of numerous new preservative systems and the approval process by which these preservatives are commercialized. In many cases these new preservative systems are evaluated by the International Code Council Evaluation Service, Inc. (ICC-ES) for which the evaluation includes how the products will perform as part of a structure (and not simply as a stand alone item), since most of the end products are intended to be used in accordance with state and local building codes in constructed structures, systems or assemblies.

The requested revision to M133-08 is an update to the specification to include wood preservative treatment systems that have been evaluated by the International Code Council Evaluation Service, Inc. (ICC-ES) and have been issued an Evaluation Service Report. In recent years, a number of proprietary wood preservative systems from several manufacturers have received or have in process ICC-ES Evaluation Reports in lieu of AWPA standardization.

For wood preservation systems seeking ICC-ES approval, the criteria for acceptance include a series of tests that are based on the system's proposed end-use (i.e. above-ground, ground contact, etc.) and are stated in AC326. The ICC-ES and AWPA processes have many common requirements that cover Laboratory Efficacy Testing, Field Efficacy Testing, Permanence/Depletion Testing Physical Properties/Corrosivity Testing and Quality Control Procedures and Evaluation. Similarly, the ICC internal review and approval process involves many of the same Laboratory and people that the AWPA approval process relies on for its approvals.

ICC-ES Evaluation Reports are available to the general public and used by building code officials to determine the compliance of new and innovative products with applicable building codes. ICC-ES Evaluation Reports and AC326 can be accessed on the website www.icc-es.org

Ballot Details

Ballot Number	**SOM-TS-4C-2009-1**
Ballot Name	Technical Section 4c- Reconfirmation Ballot
Ballot Manager	Keith Platte
Ballot Start Date	3/5/2009
Ballot Due Date	3/26/2009

Item Details

Part Number	TS-4cSOM TS 4c-2009-1- Ballot Comments.doc
Part Title	Technical Section 4c

Item Number	**1**
Item Description	Reconfirm M 224-91(2004) Use of Protective Sealers for Portland Cement Concrete.

Affirmative 14/15 Votes

Negative 1/15 Vote

Phil Stolarski - California Department of Transportation	Boiled linseed oil (M 233), with a VOC content of 400 g/L, cannot be used in California and many other states. Recommend deleting reference to it in Section 2.1 and deleting entire sections 4.4, 6.1.2, and 7.2.2. **Recommend negative be found persuasive**.

Item Number	**2**
Item Description	Reconfirm M 233-86(2004) Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.

Affirmative 14/15 Votes

Alan D. Rawson - New Hampshire Department of Transportation	Need to find out if still used. Would not meet VOC requirements for most states. **See Attachment**
Eileen Sheehy - New Jersey Department of Transportation	Does anyone use this? **See Attachment**

Negative 1/15 Vote

Phil Stolarski - California Department of Transportation	Delete - The VOC content is too high. **Recommend negative be found persuasive. Consider standard deletion or updating.**

Item Number	**3**
Item Description	Reconfirm T 143-04 Sampling and Testing Calcium Chloride for Roads and Structural Applications.

Affirmative 15/15 Votes

Negative 0/15 Votes

Ballot Details

Ballot Number	**SOM-TS-4C-2009-2**

Ballot Name	Technical Section 4c - Reconfirmation Ballot
Ballot Manager	Keith Platte
Ballot Start Date	3/25/2009
Ballot Due Date	4/15/2009

Item Details

Part Number	TS-4c
Part Title	Technical Section 4c

Item Number	**1 - No Action Required**
Item Description	Reconfirm PP 55-06(2006) Overcoating Field Test Program for Evaluating Protective Coatings on Existing Bridges or Salvaged Beams.

Affirmative 17 / 17 Votes

Negative 0 / 17 Votes

Ballot Details

Ballot Number	**SOM-TS-4C-2009-3**
Ballot Name	Technical Section 4c - Reconfirmation Ballot
Ballot Manager	Keith Platte
Ballot Start Date	5/21/2009
Ballot Due Date	6/11/2009

Item Details

	letter and also in the 2009 Book. As I understand AWPA listing in their book is: if a chemical is not listed then it either has not had enough data submitted or it has not performed well. Virginia has CA-C as treatment option for handrails but the micronized uCA-C. **Recommend comment be found persuasive. See amended revision to M133; Attachment 7.**
Timothy Ramirez - Pennsylvania Department of Transportation	Earmarking product specific references in an AASHTO standard creates numerous difficulties in implementing the use of these products by DOT forces. Typically a generic specification or 'an equal' is used to relate the new category to the existing/established categories. In this case, the Wolman AG product should be genericized to the'PTI' designation referred to in the 2008 APWA approval. It seems that the 5.1.16 designations of C(CA-C, uCA-C) need to be related to APWA standards as well. While the preservatives are related to composition, it is more important to relate the new products to function. Additionally, the requirement that these new categories can only be used by Arct Tech approved companies poses a second problem since traditionally APWA does not indicate who is approved but what standard each treater must meet. **Recommend comment be found persuasive. See amended revision to M133; Attachment 7.**
Rick Kreider - Kansas Department of Transportation	Alan, Clearly, WolmanÂ® AG is a registered trademark name. This represents the same basic argument I had with OSMOSE's submittal. We should not be listing a manufacturer's specific product, or referencing a document that is for a single manufacturer. Rick Kreider **Recommend comment be found persuasive. See amended revision to M133; Attachment 7.**

Standard Specification for

Use of Protective Sealers for Portland Cement Concrete

AASHTO Designation: M 224-~~91~~ 2010(~~2004~~2009)

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Standard Specification for

Use of Protective Sealers for Portland Cement Concrete

AASHTO Designation: M 224-~~91~~ 2010(~~2004~~2009)

1. SCOPE

1.1. This guide includes the selection factors for and use of protective sealers for highway purposes to be applied to hardened concrete for the purpose of protecting new concrete or prolonging the life of sound, in-service concrete. Information in this guide is not applicable to the repair of badly deteriorated concrete.

1.2. Sealers may be divided into two basic types: coatings, which remain on the surface; and penetrants, which penetrate into the concrete to some measurable depth.

1.3. There are strong differences of opinion about the effectiveness and durability of some types of sealers under actual service and conditions as opposed to laboratory tests which may show the sealers to be effective. It must also be understood that there can be considerable differences in performance of material from different manufacturers for the same type of sealer.

1.4. The values stated in SI units are to be regarded as the standard.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 200, Epoxy Protective Coatings
- M 233, Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete

2.2. *ASTM Standard*:

- D 490, Specification for Road Tar

2.3. *Other Reports*:

- Pfeifer, D. W. and M. J. Scali, 1981, *Concrete Sealers for Protection of Bridge Structures*, National Cooperative Highway Research Program Report 244, 138 pp.
- Munshi, Snehal and Leonid Millstein, 1984, *Low Cost Bridge Deck Surface Treatment*, Federal Highway Administration Report No. FHWA/RD-84/001, 70 pp.

3. SELECTION OF THE SEALER

3.1. A number of factors must be carefully considered when choosing a sealer. These factors include the following:

3.1.1. *Purpose*—Will the sealer be used to waterproof the concrete or prevent the ingress of chlorides? A given sealer may be better suited to one or the other of these purposes.

3.1.2. *Effectiveness*—Coatings should form an impervious membrane tightly bonded to the concrete surface, while penetrants should seal the surface pores and fill the capillaries of the concrete. Sealers should maintain their protective properties through wide temperature fluctuations and when subject to all chemical and physical conditions at the site of use.

3.1.3. *Economy*—It is desirable that the chosen sealer be low in initial cost; however, this should not take precedence over life-cycle costs, that is, cost should include consideration of frequency of reapplication necessary to maintain effectiveness.

3.1.4. *Traffic*—Sealers on traveled surfaces must not reduce the frictional properties of the concrete; some types may, with the use of a cover aggregate, increase the frictional properties. Coatings must be resistant to traffic wear; penetrants should be evaluated according to depth of penetration, since they will wear away with the concrete. If an overlay will be placed after sealer application, wear will not be a factor.

3.1.5. *Application and Curing*—Ease and simplicity of application without the use of special skills or equipment is desirable, but not critical. It is usually advantageous for a material to cure or dry in a few hours so that neither damage by rain nor lengthy closure of the facility is necessary.

3.1.6. *Color*—If color of the treated concrete is important, test blocks should be treated with candidate materials for evaluation prior to use.

3.1.7. *Safety*—Safety should be carefully considered. Several of the materials involve toxic or hazardous components. Others may have to be heated. Refer to Section 7 for details.

3.1.8. *Adverse Conditions*—Rarely it may be necessary to apply the sealer under adverse conditions such as low ambient temperatures or dampness. In these cases, a coating must be chosen that would offer some chance for reasonable success. Experience and the manufacturer's recommendations should be used in determining whether or not conditions are suitable for application.

4. SEALER TYPES

4.1. Sealers commonly used for concrete are two general types: (1) coatings—those that remain on the surface and tend to build up a layer or membrane of some thickness, and (2) penetrants—those that penetrate the concrete forming an interior or subsurface barrier. As an aid in the choice of a material suitable for a specific application, the more commonly used sealers are discussed in Sections 4.2 through 4.9.

4.1.1. *References*—additional sources of information are:

4.1.1.1. *AASHTO Standards*—M 200 and M 233.

4.1.1.2. *ASTM Standard*—D 490.

4.1.1.3. *Other Reports*—National Cooperative Highway Research Program Report 244 and Federal Highway Administration Report No. FHWA/RD-84/001.

4.2. *Epoxy Resin*—Epoxy may be considered a coating or penetrant depending on the percent of solids in the formulation. The two component epoxy resin system forms a sealer which is tough, hard, and resistant to chemicals that normally attack roadway surfaces and weathering. Before curing, epoxy has a tendency to "pin-hole," permitting later entrance of water and salt solution into the underlying concrete. Experience indicates the use of suitable primer may alleviate this. Also, application of the material during that part of the day when the concrete is cooling helps prevent "pin-holing." If formulated as a coating, flaking or peeling of the epoxy can occur due to a difference in thermal expansion of the coating and the concrete or to improper surface preparation. The protective film formed by these materials reduces frictional properties. The use of a suitable aggregate spread over the freshly applied coating greatly improves frictional properties. Epoxy systems require skill in handling and application. It is essential that the recommendations of the manufacturer be followed precisely for both application procedures and equipment. Special materials will be required for cleaning of equipment. Most persons are allergic to contact with epoxies. Therefore, recommended safety practices must be followed carefully.

4.3. *Coal Tar Epoxy*—Coal tar resins form surface coatings that are hard and durable. They are relatively resistant to many corrosive and abrasive environments and are durable under exposure to weather. They appear to function best on roadway surfaces when filled with sand and other suitable aggregate. These materials contain curing agents and strong solvents which may cause allergic reactions. They must be handled with caution; recommended safety precautions must be followed. These materials are naturally dark to black in color and may not be desirable in some locations.

~~4.4.*Linseed Oil*—Linseed oil applied to concrete surfaces penetrates and forms a partial barrier to water. It is, therefore, not subject to traffic abrasion and it does not materially change the original frictional properties of the concrete if applied at the proper rate. Linseed oil may be applied as solution. Experience indicates the solutions are more effective and longer lasting than are emulsions probably due to redispersion of the linseed oil applied as an emulsion, when subjected to salt solutions. These materials are easily applied with simple, readily available equipment and require no specialized knowledge or skills. Safety hazards are minimal, only routine precautions for handling and using flammable liquids are necessary with the solvent types. For best results on new concrete surfaces, the concrete should be allowed to dry for about 30 days prior to the application of the compound. To remain effective, concrete surfaces should be recoated annually for two years followed by a bi-annual or tri-annual schedule of treatment.~~

~~4.5.~~4.4. *Tar Primer and Seal*—Tars applied to concrete surfaces form a coating which is an effective surface barrier to water. Usually a primer must be used because of wetting difficulties on concrete. These materials may be applied in solution or softened by heat. Due to relatively poor resistance to sunlight, weather, and abrasion, these materials should be covered by a suitable bituminous mix.

~~4.6.~~4.5. *Silanes and Siloxanes*—These materials are classified as penetrants. Unlike other sealers, these materials do not truly "seal" the concrete, but react chemically with the concrete, both at the surface and in pores and capillaries, to form a hydrophobic layer which is repellant to water. They can be applied in one coat.

~~4.7.~~4.6. *Methacrylates*—These materials may be described as a coating or penetrant depending on the formulation. Two coats are usually required to get proper sealing. The surface to be treated must be dry and free of oil, grease, and loose material. Time needed between coats will vary according to ambient temperature conditions.

~~4.8.~~4.7. *Sodium Silicate*—This material is a penetrant in the form of an aqueous solution. Concrete surfaces must be clean and dry at the time of application. The material should not be applied at temperatures below 4ºC (40ºF) or during rain.

4.9.4.8. *Urethane*—This material is classified as a penetrant or a coating depending on formulation. Two coats may be required. The concrete surface should be free of loose material, clean, and dry. Some formulations should not be applied under high humidity conditions. (See manufacturer's recommendation.)

5. SURFACE PREPARATION

5.1. Surfaces to which the sealers are applied may be new concrete or concrete which has been in service for some time.

5.2. Preparation of the surfaces will vary according to the type of sealer being used. In all cases, the surfaces should be clean and free of all dirt, dust, and loose material. Old surfaces should have any oil or paint removed. The required degree of dryness of the concrete will vary accordingly to the material being used, and the manufacturer's literature should be consulted for this and other specific surface requirements.

6. SEALER PREPARATION AND APPLICATION

6.1. For best results, manufacturer's recommendations should be followed in preparing and applying sealers for concrete. Common practices for the different materials follow:

6.1.1. *Epoxy Resins and Coal Tar Epoxy*—All materials should be within applicable temperature ranges before mixing. Thorough mixing of the components in the specified proportions is essential. No more should be mixed than will be used within the pot life of the materials. Small-batch mixing can best be done in clean, dry pails or disposable containers using a mechanical stirrer, although with care, hand mixing is acceptable. For large jobs, specialized continuous mixing equipment is available and should be used.

6.1.1.1. Application on small areas can readily be made by brush, roller, squeegee, hand sprayer, or other means. Power spray equipment is most satisfactory for covering large areas.

6.1.1.2. For most materials, the temperature of the concrete surface should be not less than 15ºC (60ºF). A satisfactory temperature range for the compound at application is 21 to 32ºC (70 to 90ºF).

6.1.1.3. Equipment used in application must be cleaned using solvent wash before setting of the epoxy. The solvent recommended by the manufacturer of the epoxy is best but the others may be satisfactory, such as toluene, trichloroethylene, etc. Use appropriate safety precautions when using these solvents.

6.1.2. *Linseed Oil*—Application of linseed oil may be readily accomplished by brush, squeegee, roller, hand sprayer, or power sprayer. The concrete surface should be dry and at a temperature of not less than 10ºC (50ºF) at the time of application. The rate of application should be specified. Two approximately equal applications are best with a 24-hour minimum drying time between applications. Cleaning of tools and equipment is easily accomplished by use of kerosene or other petroleum solvent.

6.1.3.6.1.2. *Tars*—These materials may be applied by power or hand spray, by brush, or by squeegee. The concrete surface to be treated should be dry and clean. The prime coat should be permitted to dry thoroughly before applying succeeding coats. Depending on the grade of tar selected, temperature of application will vary to provide the proper viscosity for application.

6.1.4.6.1.3. *Silanes and Siloxanes*—These materials should not be applied at temperatures below 0ºC (32ºF) or when the temperature is expected to fall below 0ºC (32ºF) within 12 hours of application. These

materials appear to penetrate best on a thoroughly dry surface. Application rate should range between 2.45 and 9.82 m^2/L (100 and 400 ft^2/gallon) depending on surface texture and absorption. The recommended method of application may vary depending on the material. The manufacturer's recommendations should always be followed. The most common method of application is low pressure airless spray and most sealers require enough material to sufficiently saturate the surface of the concrete.

~~6.1.5.~~6.1.4. *Methacrylates*—Depending on the formulation, these materials should not be applied when the temperature is below 10ºC (50ºF). A primer is required for some formulations. The concrete surface must be dry. Application rates range from 2.45 to 9.82 m^2/L (100 to 400 ft^2/gallon). Sealers should be applied as the manufacturer recommends. Common methods of application include spray, roller, brush, and squeegee.

~~6.1.6.~~6.1.5. *Sodium Silicate*—This material should not be applied at temperatures below 4ºC (40ºF). It may be applied by brush, squeegee, or spraying. After three to six hours, the surface should be flushed with water, the flushing to be repeated at 24-hour intervals for 72 hours. The coverage rate is 4.91 to 7.36 m^2/L (200 to 300 ft^2/gal).

~~6.1.7.~~6.1.6. *Urethane*—This material can be applied in the temperature range of 4 to 38ºC (40 to 100ºF) with some formulations having an allowable application temperature as low as –8ºC (18ºF). The surface should be free of moisture. Coverage is in the range of 4.91 to 9.82 m^2/L (200 to 400 ft^2/gal). Sealers are best applied with either air atomized or conventional airless spray—although brush, roller, or squeegee may be used. Manufacturer's recommendations should be followed.

7. SAFETY

7.1. The usual precautions exercised in the working environment should be followed. All waste solvents shall be disposed of in accordance with all applicable federal, state, and local environmental regulations.

7.2. General hazards and cautions for each sealer type are given in Sections 7.2.1 through 7.2.7. See manufacturer's literature for information on specific formulations.

7.2.1. *Epoxy Resins and Coal Tar Epoxy*—These materials almost always cause skin irritation or allergic reactions if allowed to contact the skin. Allergic reactions may not occur immediately. Workers should never think themselves immune to these reactions. Mixing and application should always be in well-ventilated areas. Disposable equipment and clothing should be used whenever possible. Clothing of any kind should not be re-used if soiled by epoxy resin. Safety glasses or goggles are recommended while mixing or applying these materials. The workmen should always wash up thoroughly immediately after completing work. Equipment must be kept clean at all times.

7.2.1.1. In case of direct contact to the body, wash immediately with soap and water until all epoxy compound is removed. If contact is to the eyes, flush with large quantities of water and secure immediate medical attention. Use only soap and water or water-soluble cleaners on the body. The use of solvents for epoxy is to be avoided.

~~7.2.2. *Linseed Oil*—These oils are not considered toxic or irritating; therefore, the only safety hazard with their use is from burning. Normal precautions indicated for any flammable liquid should be followed.~~

~~7.2.3.~~7.2.2. *Tars*—Caution should be exercised around the hot material and heating equipment.

~~7.2.4.~~7.2.3. *Silanes and Siloxanes*—These materials may be flammable, therefore, do not store or use them near heat or open flame. They react chemically with glass, and therefore, should not be stored in glass containers.

~~7.2.5.~~7.2.4. *Methacrylates*—These materials are flammable and toxic, and caution should be taken to avoid contact with the skin or breathing concentrated vapors. Safety glasses or goggles should be worn.

~~7.2.6.~~7.2.5. *Sodium Silicate*—This material is nontoxic, noncaustic, and nonflammable. It should not be stored in glass containers since it reacts chemically with glass.

~~7.2.7.~~7.2.6. *Urethane*—This material is flammable, and some formulations produce vapors. Special protective clothing, including goggles, gloves, and respirators, must be worn when working with urethanes.

Attachment 6

Survey sent out to determine use of M 233 Boiled Linseed Oil Mixture

Hi Everyone,

Does your state use M 233-86(2004) Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete? This standard would not meet the VOC requirements for most states. Please only respond if your state is still using this standard and plans to continue to do so.

Thanks,
Alan

Responses Received By July 24, 2009.

Lloyd Welker; Ohio
We don't but I think West Virginia still does.

Jana Konecny; Ontario
The Ontario Ministry of Transportation discontinued the use of boiled linseed oil mixture for treatment of portland cement concrete many years ago (probably close to 30 years) and we have no plans to start using it in future.

Larry Lockett; Alabama
No, but we used to many years ago --treat new bridge decks with linseed oil as a sealant. However, it was never refreshed during the service life of the bridge due to concerns of low friction numbers and we quit using it all together,
Larry Lockett

David L. Lippert , Illinois
Effective July 1, of this year, the Illinois VOC requirement for "Waterproofing Concrete/Masonry Sealers" is 400 grams/liter maximum. A protective coat meeting M 233 would meet this requirement. Use is yes with a question.

Bruce Yeaton; Maine
I just spoke with a guy in the Bridge Program and he says we still use the linseed oil mixture for some cast in place concrete. However, we do not reference the AASHTO M 233 (we probably have never updated that part of our spec--Our spec currently requires a 50-50 mix of linseed oil and petroleum spirits and references ASTM D 260 and D 235 which are also referenced in M 233. I have sent an email over to the Bridge group to find out if they plan to continue using linseed if there is a VOC issue???

Bryce Simons, New Mexico
New Mexico stopped allowing Linseed Oil for concrete treatments about 10 years ago. It has proven to be ineffective and undependable, and other products work better.

Standard Specification for

Preservatives and Pressure Treatment Processes for Timber

AASHTO Designation: M 133-~~09~~10

American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001

Standard Specification for

Preservatives and Pressure Treatment Processes for Timber

AASHTO Designation: M 133-~~09~~10

1. SCOPE

1.1. This specification covers the wood preservatives, the preservative treatment processes, the results of treatment, the inspection and testing of preservatives and of treatment, and the identification of properly treated timber.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 168, Wood Products
- T 32, Sampling and Testing Brick
- T 62, Distillation of Creosote and Creosote-Coal Tar Solutions
- T 72, Saybolt Viscosity
- T 73, Flash Point by Pensky-Martens Closed Tester
- T 115, Method of Test for Distillation of Petroleum Products

2.2. *ASTM Standards*:

- D 96, Water and Sediment in Crude Oil by Centrifuge Method (Field Procedure)
- D 453, Tar Acids in Creosote-Coal Tar Solutions
- D 287, API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)

2.3. *American Wood-Preservers' Association Standards*: [1]

- U1, Use Category System: User Specification for Treated Wood
- A1, Standard Methods for Analysis of Creosote and Oil-Type Preservatives
- A2, Standard Methods for Analysis of Waterborne Preservatives and Fire-Retardant Formulations
- A3, Standard Methods for Determining Penetration of Preservatives and Fire Retardants
- A4, Standard Methods for Sampling Wood Preservatives
- A5, Standard Methods for Analysis of Oil-Borne Preservatives
- A6, Method for the Determination of Oil-Type Preservatives and Water in Wood
- A7, Standard for Wet Ashing Procedures for Preparing Wood for Chemical Analysis
- A9, Standard Method for Analysis of Treated Wood and Treating Solutions by X-ray Spectroscopy
- A11, Standard Method for Analysis of Treated Wood and Treating Solutions by Atomic Absorption Spectroscopy
- A12, Wood Densities for Preservative Retention Calculations

- A13, Standard Method of Analysis for Acid Number of Naphthenic Acids in Copper Naphthenate
- A14, Standard Method for Determination of Water-Extractable Copper in Copper Naphthenate
- A18, Standard for Determination of Quaternary Ammonium Compounds in Wood by 2-Phase Titration
- A21, Standard Method for Analysis of Wood and Wood Treating Solutions by Inductively Coupled Plasma Emission Spectrometry
- A28, Standard Method for Determination of Propiconazole and Tebuconazole in Wood, in Waterborne Formulations and in Treating Solutions by HPLC
- A31, Standard Methods for the Analysis of Solutions and Wood for Azoles by Gas Chromatography (GC)
- A37, Standard for Determination of Quaternary Ammonium Compounds in Wood and Wood Treating Solutions by Potentiometric Titration Using Sodium Tetraphenylborate
- M2, Standard for Inspection of Treated Products Treated with Preservatives
- M3, Standard Quality Control Procedures for Wood Preserving Plants
- M4, Standard for the Care of Preservative-Treated Wood Products
- M6, Brands Used on Forest Products
- P1/P 13, Standard for Creosote Preservative
- P2, Standard for Creosote Solutions
- P3, Standard for Creosote-Petroleum Solution
- P4, Standard for Petroleum Oil for Blending with Creosote
- P5, Standard for Waterborne Preservatives
- P8, Standard for Oil-Borne Preservatives
- P9, Standards for Solvents and Formulations for Organic Preservative Systems

2.4. International Code Council–Evaluation Service, Inc. (ICC–ES)

- AC326, Acceptance Criteria for Proprietary Wood Preservative Systems–Common Requirements for Treatment Process, Test Methods and Performance

3. GENERAL REQUIREMENTS

3.1. Standards of the American Wood-Preservers' Association (AWPA) and specified commercial standards are incorporated herein by reference. Attention is called to the fact that all preservatives are not equally effective on all species of wood or under all conditions of exposure. The engineer preparing the plans and specifications should select the type of preservatives, retentions, and species best suited for his purpose and conditions.

3.2. ICC-ES (International Code Council Evaluation Service, Inc.) requirements and specified commercial standards are incorporated herein by reference. Treated wood product reports issued by the ICC-ES as Evaluation Service Reports (ESRs) must be current as posted on the ICC-ES website www.icc-es.org and in compliance with AC326. The treated wood product's report must allow for the end-use that is required by the project specifications.

4. TIMBER QUALITY

4.1. The properties of the timber selected for preservative treatment shall conform to the requirements of M 168.

5. PRESERVATIVE QUALITY

5.1. The following named preservatives are acceptable in this specification. The properties shall be those set forth in the referenced AWPA Standards:

5.1.1. *Creosote*—P 1/P 13.

5.1.2. *Creosote-Coal Tar Solution*—P 2.

5.1.3. *Creosote-Petroleum Solution*—P 3.

5.1.4. *Petroleum for Blending with Creosote*—P 4.

5.1.5. *Pentachlorophenol*—P 8.

5.1.6. *Solvents Used in Pentachlorophenol Solutions*—P 9.

5.1.7. *Acid Copper Chromate*—P 5.

5.1.8. *Ammoniacal Copper Zinc Arsenate*—P 5.

5.1.9. *Chromated Copper Arsenate, Type C*—P 5.

5.1.10. *Ammoniacal Copper Quat, Type B*—P 5.

5.1.11. *Copper Naphthenate*—P 8.

5.1.12. *Alkali Copper Quat, Type C*—P 5.

5.1.13. *Copper Azole, Type A (CBA-A)*—P 5.

5.1.14. *Copper Azole, Type B (CA-B)*—P 5.

5.1.15. *Alkaline Copper Quat, Type D*—P 5.

5.1.16. Copper Azole, Type C (CA-C)—P 5.

5.1.17. Propiconazole Tebuconazole Imidacloprid (PTI)—P 5.

5.2. The following preservative systems are acceptable by means of a published and current ICC-ES Report (ESR) and are in compliance with AC326.

5.2.1. *Micronized Copper Quaternary.*

5.2.2. Micronized Copper Azole

5.2.3 Dispersed Copper Azole Type C (*μCA-C).*

6. PRESERVATIVE TREATMENT PROCESSES AND RESULTS

6.1. Wood products shall be treated in accordance with the ICC-ES Evaluation Report or AWPA Standard U1–Use Category System: User Specification for Treated Wood. A Use Category appropriate for the application shall be established in accordance with Standard U1 Sections 2 and 3. Specific requirement for various commodities can then be found in Section 6.

6.1.1. *Sawn Products*—U1, Section 6, Commodity Specification A (Includes all sawn posts and lumber).

6.1.2. *Round Timber Piling*—U1, Section 6, Commodity Specification E.

6.1.3. *Round Poles*—U1, Section 6, Commodity Specification D (16 feet or longer).

6.1.4. *Round Posts*—U1, Section 6, Commodity Specification B (Less than 16 feet long).

6.1.5. *Wood Composites*—U1, Section 6, Commodity Specification F (includes plywood).

6.2. Field treatment of cuts, holes and injuries to treated wood products shall be in accordance with AWPA Standard M4.

7. INSPECTION AND MARKING

7.1. Treatment shall conform to the quality requirements described in the ICC-ES Evaluation Report or AWPA M3–Standard Quality Control Procedures for Wood Preserving Plants. The wood treater shall apply to each piece of treated timber a legible brand, mark or tag indicating the name of the treater and the specification symbol or specification requirements to which the treatment conforms. Acceptable symbols of compliance shall be similar to brands listed in AWPA M6, or as provided for in the plans or special provisions.

7.2. The engineer shall be provided adequate facilities and free access to the necessary parts of the treating plant for inspection of material, workmanship, and treating processes, to determine that the contract requirements are met. Inspection of the treatment and products shall conform to the requirements of AWPA M2–*Standard for Inspection of Wood Products Treated with Preservatives*. The engineer reserves the right to retest all materials after delivery to the job site and to reject all materials that do not meet the requirements of the contract. Reinspection at the job site may include assay to determine retention of preservatives and extraction and analysis of preservative to determine its quality.

8. METHODS OF SAMPLING AND TESTING

8.1. The sampling and testing of wood preservatives shall be in accordance with the following standard methods of the American Association of State Highway and Transportation Officials (AASHTO), the American Society for Testing Materials (ASTM), and the American Wood-Preservers' Association (AWPA):

8.1.1. *Sampling Wood Preservatives*—AWPA A4.

8.1.2. *Specific Gravity 38/15.5 C of Creosote Solution*—AWPA A1.

8.1.3. *Water in Creosote*—AWPA A1.

8.1.4. *Insoluble Matter in Creosote*—AWPA A1.

8.1.5. *Distillation of Creosote*—AASHTO T 62; AWPA A1.

8.1.6. *Tar Acids in Creosote and Creosote-Coal Tar Solutions*—ASTM D 453.

8.1.7. *Specific Gravity of Petroleum*—ASTM D 287.

8.1.8. *Flash Point of Petroleum (Pensky-Martens)*—AASHTO T 73.

8.1.9. *Viscosity, Saybolt*—AASHTO T 72.

8.1.10. *Analysis of Water-Borne Preservatives*—AWPA A2.

8.1.11. *Analysis of Oil-Borne Preservatives*—AWPA A5.

8.1.12. *Chromium, Copper, Arsenic and Zinc in Water-borne Preservatives by X-ray*—AWPA A9, by ICP—AWPA A21, by AA—AWPA A11.

8.1.13. *Naphthenic Acid in Copper Naphthenate*—AWPA A13.

8.1.14. *Water-Extractable Copper in Copper Naphthenate*—AWPA A14

8.1.15. *Quaternary Compounds in ACQ Preservative or Micronized Copper Quaternary*—AWPA A18 or A37.

8.1.16. ~~*Tebuconazole in CBA-A and CA-B Preservatives*—AWPA A28 or A31.~~ *Propiconazole and Tebuconazole in Waterborne Preservatives by HPLC* —AWPA A28

8.1.17. ~~Wood Densities for Preservative Retention Calculations—AWPA A12.~~ *Azoles in Waterborne Preservatives and Wood by Gas Chromatography (GC)* —AWPA A31.

8.1.18. ~~Standard for Wet Ashing Procedures for Preparing Wood for Chemical Analysis—AWPA A7.~~*Imidacloprid in Waterborne Preservatives and Wood by HPLC* —AWPA A43

8.1.19. Wood Densities for Preservative Retention Calculations—AWPA A12.

8.1.20. Standard for Wet Ashing Procedures for Preparing Wood for Chemical Analysis—AWPA A7.

[1] Available from American Wood-Preservers' Association, P.O. Box 361784, Birmingham, AL 35236-1784, Tel: (205) 733-4077, www.awpa.com.

Attachment 8

From: Collins, Michael H **SMYR [MHCollins@archchemicals.com]
Sent: Thursday, March 19, 2009 10:03 AM
To: Alan Rawson
Cc: Shields, Steve C **SMYR; Gruber, Bob W **SMYR
Subject: Request for Additions to M 133

Importance: High

Mr. Rawson:

Good morning. As we have discussed, we would like to request the following wood preservatives be added to the next edition of AASHTO M 133:

- Copper Azole Type C (CA-C, µCA-C)
- Wolman® AG

Per your email below, I have also attached the following documents to represent the approval of these preservatives by AWPA and / or ICC:

- ESR-1477 (ICC Evaluation Report for Wolman® AG)
- ESR-1721(ICC Evaluation Report for Copper Azole formulations CA-B, CA-C, and µCA-C)
- AWPA Standardization Letter (CA-C)

We appreciate your assistance with this matter. Please do not hesitate to let us know if you have any comments or questions regarding this request.

Sincerely,

Michael H. Collins
Environmental Affairs Associate
Arch Wood Protection, Inc.
1955 Lake Park Drive, Suite 100
Smyrna, GA 30080
Tel: 770.803.2509
Cell: 678.938.6913
Fax: 770.801.1990
Email: mhcollins@archchemicals.com

From: Alan Rawson [mailto:ARawson@dot.state.nh.us]
Sent: Tuesday, January 13, 2009 10:34 AM
To: Collins, Michael H **SMYR
Cc: Gruber, Bob W **SMYR; Brandon Hollier (E-mail)
Subject: RE: AASHTO M 133

Mike,

As we discussed, please provide documentation from either AWPA or ICC-ES that they have approved the the preservatives that your company is requesting to be added to M 133. The approval verification could be a copy of the website listing, if you don't have an approval letter. I would prefer that what ever you send me be in an electronic form so that I can forward it for balloting. The earliest date for publication of these new preservatives would be summer 2010. Attached are the 2009 proposed changes to M 133. If approved these changes will be published this summer.

Please let me know if you have further questions.

Alan

PS - Please say hello to Brandon Hollier for me. He has helped to update M133 several times.

-----Original Message-----
From: Collins, Michael H **SMYR [mailto:MHCollins@archchemicals.com]
Sent: Friday, December 05, 2008 1:30 PM
To: Alan Rawson
Cc: Platte, Keith; Gruber, Bob W **SMYR
Subject: RE: AASHTO M 133

Mr. Rawson:

Good afternoon. Below is the main text of the original message I sent to Mr. Kobetsky. Please let us know what if anything, is needed to assist and/or proceed.

Arch Wood Protection would like to request the listing of additional wood preservatives in the next revision of AASHTO Standard M-133-08 (Section 5.). The three preservatives we would like to have added include the following products:

- *Copper Azole Type C (CA-C)*
- *Copper Azole Type C, Dispersed (µCA-C)*
- *Wolman® AG*

Please have any questions that might arise form this request forwarded to my attention.

Thank you for your assistance with this.

Michael H. Collins
Environmental Affairs Associate

Arch Wood Protection, Inc.
1955 Lake Park Drive, Suite 100
Smyrna, GA 30080
Tel: 770.803.2509
Cell: 678.938.6913
Fax: 770.801.1990
Email: mhcollins@archchemicals.com

From: Platte, Keith [mailto:KPlatte@aashto.org]
Sent: Friday, December 05, 2008 1:26 PM
To: Collins, Michael H **SMYR
Cc: Rawson, Alan D.
Subject: AASHTO M 133

Mr. Collins,

Please contact Mr Alan Rawson (603-271-3151) considering M 133. I have also cc'd him on this email.

Keith M. Platte, P.E.
Program Director for Materials and Product Evaluation
American Association of State Highway and Transportation Officials
444 N. Capitol St. N.W. Suite 249
Washington D.C. 20001
Ph: 202 624 7830
Fax: 202 624 5469
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Bessie M. Woodward, *Vice Chair*
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Randy Deweese
Treasurer
Colin McCown
Executive VP & Secretary

VIA E-MAIL ONLY

Thursday, 15 January 2009

Roger Fox
Arch Wood Protection
3941 Bonsal Road
Conley, GA 30288
rffox@archchemicals.com

RE: Copper Azole Type C Proposals

Dear Roger,

I have received your written request for confirmation of final action taken by the AWPA Executive Committee on your recent proposals. In response to your request, the purpose of this letter is to inform you that the AWPA Executive Committee ratified the results of the Fall 2008 Preservatives and Treatments General Committee Ballots on 15 January 2009. In essence, all of your proposals passed Subcommittee and General Committee action, as well as public and association review. Therefore, effective today, Copper Azole Type C (CA-C) and several types of wood products treated with this preservative are now standardized in accordance with AWPA's procedures. CA-C will appear as proposed and balloted in the 2009 AWPA Book of Standards, scheduled for release in April 2009.

If you have any questions or require additional information, please do not hesitate to contact me.

Best regards,

Colin McCown, Executive Vice President
American Wood Protection Association, Inc.

ICC-ES Evaluation Report

ESR-1477

Reissued January 1, 2009

This report is subject to re-examination in one year.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 06—WOOD AND PLASTICS
Section: 06070—Wood Treatment

REPORT HOLDER:

ARCH TREATMENT TECHNOLOGIES, INC.
1955 LAKE PARK DRIVE, SUITE 100
SMYRNA, GEORGIA 30080
(770) 801-6600
www.wolmanizedwood.com
ptwinfo@archchemicals.com

EVALUATION SUBJECT:

WOLMANIZED L³ OUTDOOR® WOOD

ADDITIONAL LISTEES:

EVERWOOD TREATMENT
11349 HIGHWAY 31
SPANISH FORT, ALABAMA 36527

MCCREADY LUMBER
4801 WUNRO ROAD
PULASKI, VA 24301

MID-STATES WOOD PRESERVERS
147 SHELBY ROAD
SIMSBORO, LOUISIANA 71275

NORTHEAST TREATERS
201 SPRINGFIELD ROAD
BELCHERTOWN, MASSACHUSETTS 01007

PETERSON WOOD TREATING
2 RANDY JOHNSON STREET
SUPERIOR, WISCONSIN 54880

H.M. STAUFFER & SONS
33 GLENOLA DRIVE
LEOLA, PENNSYLVANIA 17540

TRUEGUARD LLC
715 DENVER AVENUE
LOVELAND, COLORADO 80537

TSO OF VIRGINIA
1050 NORTH MAIN STREET
ROCKY MOUNT, VIRGINIA 24151

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code®* (IBC)
- 2006 *International Residential Code®* (IRC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Preservative-treated wood
- Decay resistance
- Termite resistance
- Corrosion
- Structural

2.0 USES

Wolmanized L³ Outdoor® Wood is used for wood members in above ground applications that are required by the code to be protected against decay and termites.

3.0 DESCRIPTION

3.1 General:

Wolmanized L³ Outdoor® Wood products are recognized for use in above ground applications and to resist attack by fungal decay and subterranean termites, including Formosan termites.

Wolman® AG brand wood preservatives are produced by Arch Treatment Technologies, Inc., and are used by the wood-preserving plants listed in this report as additional listees to preservative-treat wood products in accordance with the Wolmanized L³ Outdoor® Wood Standard (WL3OW-08) and the Wolman® AG Wood Preservative Manual of Standard Practice.

3.2 Preservative System:

Wolman® AG wood preservatives are propiconazole-tebuconazole-imidacloprid (PTI) preservative systems used for treating wood members. The active fungicides and termiticide in Wolman® AG wood preservative are propiconazole, tebuconazole and imidacloprid in a ratio of 10:10:1. These compounds are emulsified in water using a proprietary blend of dispersants.

3.3 Wood Species:

Wolmanized L³ Outdoor® Wood may consist of the following preservative treated materials:

a. Dimensional lumber and timbers of the following species consisting of primarily sapwood: southern pine, mixed southern pine, ponderosa pine, red pine, radiata pine, redwood, western red cedar and Caribbean pine.

b. Dimensional lumber and timbers of the following species consisting of primarily heartwood: Douglas fir, western hemlock, hem-fir.

c. Lumber, of nominal size of 2-by-8 or less, for decking and specialty use of the species listed in (a) and (b), above.

d. Southern pine and Douglas fir plywood.

Minimum preservative retention levels are provided in Table 1 of this evaluation report.

4.0 INSTALLATION

4.1 General:

Wolmanized L^3 Outdoor® Wood is installed as preservative-treated lumber, timbers and plywood in accordance with the requirements of the applicable code.

Arch Treatment Technologies, Inc., and industry published installation instructions for wood and pressure-treated wood and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

The instructions within this report govern if there are any conflicts between Arch Treatment Technologies, Inc., instructions and this report.

4.2 Applications:

Wolmanized L^3 Outdoor® Wood products may be used in above ground locations where wood is used and/or in above ground locations required by the code to be resistant to fungal decay or termites. The treated wood members are recognized for use in above ground applications in all building types and occupancies where permitted by the applicable code. Typical applications are described in Table 2.

Locations requiring preservative-treated wood for fungal decay or termite resistance are described in Section 2304.11 of the IBC, and Sections R319 and R320 of the IRC.

4.3 Fasteners:

The fasteners used with Wolmanized L^3 Outdoor® Wood products must be in accordance with Section 2304.9.5 of the IBC and Section R319.3 of the IRC, except that aluminum fasteners are also permitted.

4.4 Structural:

4.4.1 Duration of Load: The maximum load duration factor allowed for Wolmanized L^3 Outdoor® Wood products used for structural members is 1.6, in accordance with Section 2.3 of the American Forest & Paper Association (AF&PA) National Design Specification for Wood Construction (NDS).

4.4.2 Incising Factor: When the treated wood products have been incised, the reference design values must be multiplied by the incising factor, C_i, in accordance with Section 4.3.8 of the NDS.

5.0 CONDITIONS OF USE

The Wolmanized L^3 Outdoor® Wood described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Use of the preservative-treated wood is limited to the types of applications noted under Section 4.2 of this report.

5.2 Surface treatment of field cuts must be in accordance with the recommendations of Arch Treatment Technologies, Inc.

5.3 The Wolmanized L^3 Outdoor® Wood products are limited to the wood species and minimum retention levels noted in Section 3.3 and Table 1.

5.4 Treatment is at the facilities of the listees noted in Table 3, under a quality control program with inspections by Timber Products Inspection Inc. (AA-664 and AA-696) or Southern Pine Inspection Bureau (AA-680).

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Proprietary Wood Preservative Systems—Common Requirements for Treatment Process, Test Methods and Performance (AC326), Appendix F, dated October 2008.

7.0 IDENTIFICATION

Wolmanized L^3 Outdoor® Wood lumber and plywood must be labeled with the name of the inspection agency (Timber Products Inspection Inc. or Southern Pine Inspection Bureau); the product name (Wolmanized L^3 Outdoor® Wood) or logo (see Figure 1); the treatment company name and plant location; the name of the preservative components or designation (PTI); minimum retention; the intended end use; and the evaluation report number (ESR-1477). A sample label is shown in Figure 1 of this report.

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products in this report were evaluated for compliance with the requirements of the following legacy codes and earlier editions of the International codes:

- 2003 International Building Code® (2003 IBC)
- 2003 International Residential Code® (2003 IRC)
- 2000 International Building Code® (2000 IBC)
- 2000 International Residential Code® (2000 IRC)
- 1997 Uniform Building Code™ (UBC)
- BOCA® National Building Code/1999 (BNBC)
- 1999 Standard Building Code© (SBC)

The Wolmanized L^3 Outdoor® Wood preservative-treated lumber and plywood described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.1 through 8.6.

8.1 USES

See Section 2.0

8.2 DESCRIPTION

See Section 3.0

8.3 INSTALLATION

See Section 4.0, except for the following modifications:

Locations requiring preservative-treated wood for decay or termite resistance are described in Section 2304.11 of the 2000 and 2003 IBC, Sections R323, R324 of the 2000 IRC, Sections R319 and R320 of the 2003 IRC, Section 2304 of the SBC, Section 2311 of the BNBC, Section 2306 of the UBC.

The fasteners used with Wolmanized L^3 Outdoor® Wood products must be in accordance with Section 2304.9.5 of the 2000 and 2003 IBC, Section R323.3 of the 2000 IRC, Section R319.3 of the IRC, Section 2306.3 of the SBC, Section 2311.3.3 of the BNBC, Section 2304.3 of the UBC, except that aluminum fasteners are also permitted.

8.4 CONDITIONS OF USE

See Section 5.0

8.5 EVIDENCE SUBMITTED

See Section 6.0

8.6 IDENTIFICATION

See Section 7.0

TABLE 1 - MINIMUM RETENTION REQUIREMENTS FOR WOLMANIZED L[3] OUTDOOR WOOD PRODUCTS

Species	Minimum Actives pcf (kg/m^3)[1]	
	UC1, UC2, UC3A	UC3B
Pine species	0.013 (0.21)	0.018 (0.29)
Pine species with 0.24 pcf water repellent	- -	0.013 (0.21)
Other species	0.013 (0.21)	0.018 (0.29)

[1] Retention is expressed in pounds of preservative actives per cubic foot (kilograms per cubic meter)

TABLE 2—TYPICAL APPLICATIONS FOR WOLMANIZED L[3] OUTDOOR® WOOD PRODUCTS

SERVICE CONDITIONS	AWPA USE CATEGORY	TYPICAL APPLICATIONS
Interior construction, above ground, dry	UC1	Interior construction - millwork and furnishings
Interior construction, above ground, damp	UC2	Interior construction - interior beams, timbers, flooring, millwork and sill plates
Exterior construction, above ground, coated & rapid water runoff	UC3A	Exterior - coated millwork, siding and trim
Exterior construction, above ground, uncoated and poor water runoff	UC3B	Decking, guard rails, spindles, flooring, deck joists, beams and framing, deck posts above grade supported on concrete piers with a steel bracket, trim and fascia, sill plates, fence rails, trellises, gazebos

TABLE 3—WOOD PRESERVATIVE TREATMENT LOCATIONS

LISTEES	WOOD PRESERVATIVE TREATMENT LOCATIONS
McCready Lumber Company Inc.	Pulaski, VA
Mid-States Wood Preservers	Simsboro, LA
Northeast Treaters	Belchertown, MA
Peterson Wood Treating	Superior, WI
H.M. Stauffer & Sons	Leola, PA
TrueGuard LLC	Loveland, CO
TSO of Virginia	Rocky Mount, VA

AUTHENTIC WOLMANIZED RESIDENTIAL OUTDOOR WOOD Wood Treated Right™	0.013 pcf PTI **Above Ground Use** Protected ESR-1477 Monitored by [Inspection Agency Name AA-###]
Treating Company Name And Plant Location(s)	

AUTHENTIC WOLMANIZED RESIDENTIAL OUTDOOR WOOD Wood Treated Right™	0.013 pcf PTI with Water Repellent **Above Ground Use** Exposed ESR-1477 Audited by [Inspection Agency Name AA-###]
Treating Company Name And Plant Location(s)	

AUTHENTIC WOLMANIZED RESIDENTIAL OUTDOOR WOOD Wood Treated Right™	0.18 pcf PTI **Above Ground Use** Exposed ESR-1477 Audited by [Inspection Agency Name AA-###]
Treating Company Name And Plant Location(s)	

1. Refer to Table 1 for minimum preservative retentions by end use and special requirements for wood species and water repellents
2. Refer to Table 2 for service conditions and typical applications
3. Refer to Table 3 for Treating Company Names and Plant Locations

FIGURE 1—SAMPLE PRODUCT LABELS, Wolmanized L[3] Outdoor® Wood[1]

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 06—WOOD AND PLASTICS
Section: 06070—Wood Treatment

REPORT HOLDER:

ARCH TREATMENT TECHNOLOGIES, INC.
1955 LAKE PARK DRIVE, SUITE 100
SMYRNA, GEORGIA 30080
(770) 801-6600
www.wolmanizedwood.com
ptwinfo@archchemicals.com

EVALUATION SUBJECT:

WOLMANIZED® OUTDOOR® PRESERVATIVE-TREATED WOOD

ADDITIONAL LISTEES:

AMELIA LUMBER COMPANY
16951 LEIDIG STREET
AMELIA, VIRGINIA 23002

ANDERSON BROTHERS LUMBER
8700 OTTERBURN ROAD
AMELIA, VIRGINIA 23002-0091

BABB LUMBER COMPANY
6652 HIGHWAY 41 NORTH
RINGGOLD, GEORGIA 30736

BESTWAY ENTERPRISES, INC.
3877 LUKER ROAD
CORTLAND, NEW YORK 13045

JOHN A. BIEWER COMPANY, INC.
812 SOUTH RIVERSIDE DRIVE
ST. CLAIR, MICHIGAN 48079

BORICUA WOOD PROCESSING
ROAD 865 KM 5.5
TOA BAJA, PUERTO RICO 00952

BOWIE-SIMS-PRANGE, INC.
1440 HUTTON DRIVE
CARROLLTON, TEXAS 75006

BRANDON WOOD PRESERVING
800 9TH AVENUE
BRANDON, SOUTH DAKOTA 57005

CABO ROJO TREATING
BARRIO BALLAJA, KM 1.1
CARRETERA 312-313, APARTADO 765
CABO ROJO, PUERTO RICO 00623

C.M. TUCKER LUMBER COMPANY, INC.
601 NORTH PEARL STREET
PAGELAND, SOUTH CAROLINA 29728

CONRAD FOREST PRODUCTS
68765 WILDWOOD ROAD
NORTH BEND, OREGON 97459

COX INDUSTRIES, INC.
860 CANNON BRIDGE ROAD
ORANGEBURG, SOUTH CAROLINA 29115

DANTZLER, INC.
7850 WEST BEAVER STREET
JACKSONVILLE, FLORIDA 32220

EAST TENNESSEE FOREST PRODUCTS
945 POTTERTOWN ROAD
MOSHEIM, TENNESSEE 37818

ESCUE WOOD PRESERVING, INC.
164 POST MILLWOOD ROAD
MILLWOOD, KENTUCKY 42762

EVERWOOD TREATMENT COMPANY
11349 HIGHWAY 31
SPANISH FORT, ALABAMA 36527

EXTERIOR WOOD, INC.
2685 INDEX STREET
WASHOUGAL, WASHINGTON 98671

FOLLEN WOOD PRESERVING COMPANY, INC.
1242 LANGLEY AVENUE
JACKSON, MISSISSIPPI 39204

GEORGIA-PACIFIC, LLC
19560 ALABAMA HIGHWAY 1272
ATHENS, ALABAMA 35614-6810

GREAT SOUTHERN ENTERPRISES
41815 HIGHWAY 195 SOUTH
HALEYVILLE, ALABAMA 35565

HATFIELD LUMBER COMPANY
139 POLK 29
HATFIELD, ARKANSAS 71945

HOGAN LUMBER COMPANY
325 TALLAHASSEE ROAD
ATHENS, GEORGIA 30604

HOOSIER WOOD PRESERVERS, INC.
3605 FARNSWORTH AVENUE
INDIANAPOLIS, INDIANA 46241

*Revised July 2008

H.M. STAUFFER & SONS, INC.
33 GLENOLA DRIVE
LEOLA, PENNSYLVANIA 17540-1902

KING TREATMENT
1364 MARCUM ROAD
ONEIDA, TENNESSEE 37841

LAVELLE
115 31ST STREET SOUTH
FARGO, NORTH DAKOTA 58108-2583

LONG LIFE TREATED WOOD
8150 OLD RAILROAD ROAD
HEBRON, MARYLAND 21830

MADISON WOOD PRESERVERS, INC.
216 OAK PARK ROAD
MADISON, VIRGINIA 22727

McCREADY LUMBER COMPANY
4801 WURNO ROAD
PULASKI, VIRGINIA 24301

McFARLAND CASCADE POLE & LUMBER COMPANY
1640 EAST MARC STREET
TACOMA, WASHINGTON 98421

MID-STATES WOOD PRESERVERS
147 SHELBY ROAD
SIMSBORO, LOUISIANA 71275-0560

MIDWEST TIMBER, INC.
109 KRAUS ROAD
EDWARDSBURG, MICHIGAN 49112

NORTHEAST TREATERS, INC.
201 SPRINGFIELD ROAD
BELCHERTOWN, MASSACHUSETTS 01007-0802

PEACH STATE MANUFACTURING
4250 STACKS ROAD
COLLEGE PARK, GEORGIA 30349

PERMA-TREAT OF ILLINOIS
602 NORTH CARBON STREET
MARION, ILLINOIS 62959

PETERSON WOOD TREATING, INC.
2 RANDY JOHNSON STREET, INDUSTRIAL PARK
SUPERIOR, WISCONSIN 54880

PHILLIPS BUILDING SUPPLY OF GULFPORT, INC.
9185 HIGHWAY 49
GULFPORT, MISSISSIPPI 39505

PITTS LUMBER COMPANY
ROUTE 17
SALUDA, VIRGINIA 23149

PUERTO RICO WOOD TREATING INDUSTRIES
AVE. 65 DE INFANTERIA KM. 7.0
CAROLINA, PUERTO RICO 00985

ROBBINS PRESERVING & MANUFACTURING
1301 NORTH NEBRASKA AVENUE
TAMPA, FLORIDA 33612

ROBINSON LUMBER & TREATING
20110 220TH STREET
McGRATH, MINNESOTA 56350

ROCKY TOP BUILDING PRODUCTS, INC.
1050 NORTH MAIN STREET
ROCKY MOUNT, VIRGINIA 24151

SIMMONS WOOD PRODUCTS
47235 WEST LOUIS JOHNSON DRIVE
MARICOPA, ARIZONA 85299

SOUTH HOUSTON LUMBER
607 DUMONT STREET
SOUTH HOUSTON, TEXAS 77587

SOUTHERN WOOD TREATMENT
441 GAWTHROPE DRIVE
WINCHESTER, KENTUCKY 40391

TIMBER WHOLESALERS
357 COUNTY ROAD 5 SW
WILLMAR, MINNESOTA 56201

TRUEGUARD, LLC
2801 NORTH STATE STREET
UKIAH, CALIFORNIA 95482

UTAH WOOD PRESERVING COMPANY
1959 SOUTH 1100 WEST
WOODS CROSS, UTAH 84087

US FENCE
720 NORTH MAIN STREET
BULLS GAP, TENNESSEE 37711

VARN WOOD PRODUCTS, LLC
107 NORTH BRANTLEY AVENUE
HOBOKEN, GEORGIA 31542

WESTERN WOOD PRODUCTS
181 NEW MEXICO STATE HIGHWAY 555
RATON, NEW MEXICO 87740

WOOD PRESERVERS, INC.
15939 HISTORY LAND HIGHWAY
WARSAW, VIRGINIA 22572

WOODTREATERS, INC.
224 SAWDUST ROAD
ROCKY POINT, NORTH CAROLINA 28457

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Preservative-treated wood
- Decay resistance
- Termite resistance
- Corrosion
- Structural

2.0 USES

Wolmanized® Outdoor® preservative-treated wood is used for wood members that are required by the code to be protected against decay and termites.

3.0 DESCRIPTION

3.1 General:

Wolmanized® Outdoor® preservative-treated wood products are recognized for use in aboveground, ground contact, and freshwater contact applications and resist attack by fungal decay, and subterranean termites, including Formosan termites.

Wolman® E brand wood preservatives are produced by Arch Treatment Technologies, Inc., and are used by independently owned and operated wood preserving plants listed in Table 3 of this report to preservative-treat wood products in accordance with Wolmanized® Outdoor® Wood Standards and Wolman® E Quality Control Procedures.

3.2 Preservative System:

Wolman® E wood preservatives are waterborne, copper-tebuconazole preservative systems used for wood members that are required by the code to be protected against fungal decay or termites, or where such protection is desired.

Wolman® E wood preservatives are based on copper combined with the organic fungicides tebuconazole and propiconazole. There are three formulations, copper azole Type B (CA-B), copper azole Type C (CA-C), and dispersed Type C (μCA-C). The CA-B formulation contains copper and tebuconazole. The CA-C formulation contains copper, propiconazole and tebuconazole. The dispersed version is designated with a μ and has the copper in a micronized form.

3.3 Wood Species:

Wolman® E CA-B and CA-C wood preservatives are used to preservative-treat the following materials:

a. Dimensional lumber and timbers of the following species consisting of primarily sapwood: southern pine, ponderosa pine, red pine, radiata pine, Scots pine, and Caribbean pine.

b. Dimensional lumber and timbers of the following species consisting of primarily heartwood: Douglas fir, western hemlock, hem-fir.

c. Lumber, of nominal size of 2-by-8 or less, for decking and speciality use of the species listed in (a) and (b), above.

d. Southern pine and Douglas fir plywood.

e. Round and sawn posts and building poles of southern pine, ponderosa pine, red pine, Douglas fir, hem-fir and western hemlock.

f. Round timber piling, southern pine, ponderosa pine, and red pine.

Minimum preservative retention levels are provided in Table 1 of this evaluation report.

Wolman® E μCA-C wood preservative is used to preservative-treat the following materials:

a. Dimensional lumber and timbers of the following species consisting of primarily sapwood: southern pine, ponderosa pine, red pine, radiata pine, and Caribbean pine.

b. Lumber of nominal size 2-by-8 or less, for decking and specialty use of the species listed in (a) above.

c. Southern pine plywood.

Minimum preservative retention levels are provided in Table 1 of this evaluation report.

4.0 INSTALLATION

4.1 General:

Wolmanized® Outdoor® preservative-treated wood is installed as preservative-treated lumber, timbers and plywood in accordance with the requirements of the applicable code.

Arch Treatment Technologies' and industry published installation instructions for wood and pressure-treated wood and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

The instructions within this report govern if there are any conflicts between Arch Treatment Technologies' instructions and this report.

4.2 Applications:

Wolmanized® Outdoor® preservative-treated wood products are recognized for use in locations where wood is used and/or in locations required by the code to be fungal decay or termite resistant. The treated wood products are recognized for use in aboveground, ground contact and freshwater applications in all building types and occupancies where permitted by the applicable code. Typical applications are described in Table 2.

Locations requiring preservative-treated wood for fungal decay or termite resistance are described in Section 2304.11 of the IBC, and Sections R323 and R324 of the IRC.

4.3 Fasteners:

Fasteners used with Wolmanized® Outdoor® preservative-treated wood products must be in accordance with Section 2304.9.5 of the IBC and Section R319.3 of the IRC.

4.4 Structural:

4.4.1 Duration of Load: The maximum load duration factor allowed for structural members pressure-treated with Wolman® E wood preservatives must be 1.6 in accordance with Section 2.3 of the American Forest & Paper Association (AF&PA) National Design Specification for Wood Construction (NDS).

4.4.2 Incising Factor: When the treated wood products have been incised, the reference design values must be multiplied by the incising factor, C_i, in accordance with Section 4.3.8 of the NDS.

5.0 CONDITIONS OF USE

The Wolmanized® Outdoor® preservative-treated wood described in this report complies with, or is a suitable alternative to what is specified in those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Dimensional lumber designated for "Decking Use" must be a maximum of 2 inches (51 mm) thick and 8 inches (203 mm) wide.

5.2 Use of the preservative-treated wood is limited to the type of applications noted in Section 4.2 of this report.

5.3 Wolman® E wood preservatives are not recognized for use in treating LVL, OSB, or FRTW wood products.

5.4 Surface treatment of field cuts must be in accordance with the recommendations of Arch Treatment Technologies, Inc.

5.5 The Wolmanized® Outdoor® treated wood products are limited to the wood species noted in Section 3.3 with minimum retentions noted in Table 1.

5.6 The treatment process followed by each of the treaters recognized in this report must comply with this report, Arch Treatment Technologies Treatment Standards WOW-07 and WOD-07, and the Quality Control Manual for Treatment with Wolman® E Preservative.

5.7 Treatment of wood products is at the facilities of the treaters noted in Table 3, under a quality control program with inspections by Timber Products Inspection Inc. (AA-664 and AA-696) or Southern Pine Inspection Bureau (AA-680).

6.0 EVIDENCE SUBMITTED

Data in accordance with Appendix A, Copper-Azole Wood Preservative Treatment Systems (formerly AC143), of the ICC-ES Acceptance Criteria for Proprietary Wood Preservative Systems—Common Requirements for Treatment Process, Test Methods and Performance (AC326), dated February, 2008.

7.0 IDENTIFICATION

Wolmanized® Outdoor® preservative-treated lumber and plywood must be labeled or stamped with the name of the inspection agency (Timber Products Inspection Inc. or Southern Pine Inspection Bureau); the Wolmanized® Wood logo (see Figure 1); the production plant identification; the preservative designation CA-B, CA-C or µCA-C; minimum retention; the intended end use; and the evaluation report number (ESR-1721). See Figure 1 for sample label.

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following legacy codes and earlier editions of the International Codes:

- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IBC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*© (SBC)

The Wolmanized® Outdoor® preservative-treated wood products described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.1 through 8.6.

8.1 Uses:

See Section 2.0.

8.2 Description:

See Section 3.0.

8.3 Installation:

See Section 4.0, except for the following modifications:

Locations requiring preservative-treated wood for decay or termite resistance are described in Section 2304.11 of the 2000 and 2003 IBC, Sections R323 and R324 of the 2000 IRC, Sections R319 and R320 of the 2003 IRC, Section 2304 of the SBC, Section 2311 of the BNBC, and Section 2306 of the UBC.

Fasteners used with Wolmanized® Outdoor® preservative-treated wood products must be in accordance with Section 2304.9.5 of the 2000 and 2003 IBC, Section R323.3 of the 2000 IRC, Section R319.3 of the 2003 IRC, Section 2306.3 of the SBC, Section 2311.3.3 of the BNBC, and Section 2304.3 of the UBC.

8.4 Conditions of Use:

See Section 5.0.

8.5 Evidence Submitted:

See Section 6.0.

8.6 Identification:

See Section 7.0.

TABLE 1—MINIMUM PRESERVATIVE RETENTION REQUIREMENTS FOR WOLMANIZED® OUTDOOR® PRESERVATIVE-TREATED WOOD PRODUCTS BY END USE

END USE	MINIMUM ACTIVES RETENTION[1] pcf (kg/m³)		
	CA-B[2]	CA-C[3]	μCA-C[3]
Above ground - general use	0.10 (1.7)	0.06 (1.0)	0.05 (0.8)
Above ground - decking & specialties use			
• Species listed in Section 3.3 (primarily sapwood)	0.08 (1.3)	0.06 (1.0)	0.05 (0.8)
• Species listed in Section 3.3 (primarily heartwood)	0.21(3.3)	0.15 (2.4)	0.14 (2.2)
Ground contact - general use	0.21 (3.3)	0.15 (2.4)	0.14 (2.2)
Ground contact - critical structural members	0.31 (5.0)	0.25 (4.0)	0.23 (3.6)
Ground contact - wood foundation systems	0.31 (5.0)	0.25 (4.0)	0.23 (3.6)
Foundation and freshwater piling, round	0.41 (6.6)	0.35 (5.7)	0.33 (5.3)

[1]Retention is expressed in pounds of preservative per cubic foot (kilograms per cubic meter) of preservative actives.
[2]Minimum retention of CA-B expressed as copper metal + tebuconazole.
[3]Minimum retention of CA-C and μCA-C expressed as copper metal + tebuconazole + propiconazole.

TABLE 2—TYPICAL APPLICATIONS FOR WOLMANIZED® OUTDOOR® PRESERVATIVE-TREATED WOOD PRODUCTS

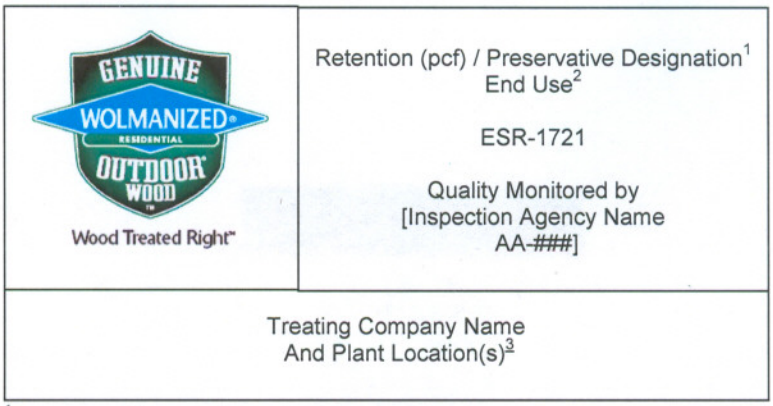
SERVICE CONDITIONS	AWPA USE CATEGORY	TYPICAL APPLICATIONS
Above ground, interior dry uses	UC1	Interior construction, furnishings and millwork
Above ground, interior damp uses	UC2	Interior beams, timbers, flooring, millwork and sill plates
Above ground, exterior uses coated and rapid water runoff	UC3A	Coated millwork, siding, spindles, fascia and trim
Above ground - general use	UC3B	Decking, rails, spindles, trim and fascia, framing, flooring, sill plates, trellises, gazebos, fencing
Ground contact - general use	UC4A	Deck support posts, fence posts, retaining walls
Ground contact - critical structural	UC4B	Permanent wood foundations, sawn and round building poles
Ground contact or freshwater uses– critical structural components	UC4C	Land and freshwater foundation piling

TABLE 3—WOOD PRESERVATIVE TREATMENT LOCATIONS

LISTEES	WOOD PRESERVATIVE TREATMENT LOCATIONS
Amelia Lumber Company	Amelia, VA
Anderson Brothers Lumber	Amelia, VA
Babb Lumber	Ringgold, GA Vincennes, IN
Bestway Enterprises, Inc. [Treater Name Bestway of New York] Bestway of Gouverneur Bestway of New England Bestway of Pennsylvania Bestway South	Courtland, NY Gouverneur, NY S. Lancaster, MA Cresco, PA Stony Point, NC
John A Biewer Company	Seneca, IL Lansing, MI Prentice, WI
Boricua Wood Processing	Tora Baja, PR
Bowie-Sims-Prange, Inc.	Carrollton, TX
Brandon Wood Preserving	Brandon, SD
Cabo Rojo Treating	Cabo Rojo, PR
Conrad Forest Products	Northbend, OR Arbuckle, CA Rainier, OR

TABLE 3—WOOD PRESERVATIVE TREATMENT LOCATIONS (Continued)

LISTEES	WOOD PRESERVATIVE TREATMENT LOCATIONS
Cox Industries, Inc. [Treater Name Cox Wood Preserving] Cove City Wood Preserving Structural Wood Preserving Sumter Wood Preserving Cox of VA	Orangeburg, SC Cove City, NC Coleridge, NC Sumter, SC Blackstone, VA
Dantzler, Inc.	Jacksonville, FL
East Tennessee Forest Products	Mosheim, TN
Escue Wood Preserving	Millwood, KY
Everwood Treatment Company	Spanish Fort, AL
Exterior Wood, Inc.	Washougal, WA
Follen Wood Preserving Company	Jackson, MS
Georgia-Pacific, LLC	Athens, AL
Great Southern Enterprises	Haleyville, AL
Hatfield Lumber Company	Hatfield, AR
Hogan Lumber Company	Athens, GA
Hoosier Wood Preservers, Inc.	Indianapolis, IN
King Treatment	Oneida, TN
Lavelle Company	Fargo, ND
Long Life Treated Wood	Hebron, MD
Madison Wood Preservers, Inc.	Madison, VA
McCready Lumber Company	Pulaski, VA
McFarland Cascade Pole & Lumber Company	Tacoma, WA
Mid-States Wood Preservers	Simsboro, LA
Midwest Timber	Edwardsburg, MI
Northeast Treaters of Massachusetts Northeast Treaters of New York	Belchertown, MA Athens, NY
Peach State Manufacturing	College Park, GA
Perma-Treat of Illinois	Marion, IL
Peterson Wood Treating	Superior, WI
Phillips Building Supply of Gulfport, Inc.	Gulfport, MS
Pitts Lumber Company	Saluda, VA
Puerto Rico Wood Treating Industries, Inc. [Treater Name Puerto Rico Wood Treating] Gulf Treating Southern Wood Treating	Carolina, PR Puerto Nuevo, PR Guayanilla, PR
Robbins Wood Preserving & Manufacturing	Tampa, FL Gainesville, GA Orlando, FL Rockwell, NC Thomaston, GA
Rocky Top Building Products, Inc. [Treater Name TSO of Virginia] TSO of Maryland TSO of Ohio	Rocky Mount, VA Hagerstown, MD Fombell, PA
Robinson Lumber & Treating	McGrath, MN
Simmons Wood Products	Maricopa, AZ
South Houston Lumber	S. Houston, TX
Southern Wood Treatment	Winchester, KY
H.M. Stauffer & Sons, Inc.	Leola, PA
Timber Wholesalers	Willmar, MN
C.M. Tucker Lumber Company	Pageland, SC
Utah Wood Preserving Company	Woods Cross, UT
TrueGuard, LLC [Treater name TrueGuard. LLC or Allweather Wood]	Ukiah, CA Loveland, CO Washougal, WA White City, OR
US Fence	Bulls Gap, TN
Varn Wood Products, LLC	Hoboken, GA
Western Wood Products	Raton, NM
Wood Preservers, Inc.	Warsaw, VA
Woodtreaters, Inc.	Rocky Point, NC



[1] Refer to Table 1 for Minimum Retentions and Preservative Designations
[2] Refer to Table 2 for AWPA Use Category Designations and End Uses
[3] Refer to Table 3 for Treating Company Names and Plant Locations

FIGURE 1—SAMPLE PRODUCT LABEL

	Retention as specified	Copper as CuO	Quat active	Min. Sum
ACQ	4.0	2.1	1.1	4.0
Type	6.4	3.4	1.8	6.4
C	9.6	5.1	2.6	9.6
	12.8	6.7	3.5	12.8
	16	8.5	4.3	16

20. CX Type A (CX-A) *Copper HDO, Type A was added to this Standard in 2006.*

20.1 CX Type A shall have the following composition:

Copper as CuO	61.5%
Boron as Boric Acid	24.5%
HDO as HDO	14.0%

Subject to the tolerances listed in paragraph 20.2.

The above shall be dissolved in a solution of ethanolamine in water. The weight of ethanolamine contained in the treating solution shall be 4.1 ± 0.3 times the weight of the copper.

20.2 The composition of the preservative present in a treating solution may vary within the following limits:

	Min%	Max%
Copper as CuO	55.3%	67.7%
Boron as Boric Acid	22.1%	26.9%
HDO as HDO	12.6%	15.4%

20.3 The treating solution shall contain bivalent copper, boric acid and HDO derived from compounds in excess of 95% purity on an anhydrous basis. The commercial preservative shall be labeled as to its total content of active ingredient listed in paragraph 20.1.

20.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the applicable standard methods of the AWPA.

21. COPPER NAPHTHENATE, WATERBORNE (CuN-W) *(Adopted in 2006.)*

21.1 Waterborne copper naphthenate concentrate shall have the following nominal composition:

Copper as Cu	5.0%
Copper Naphthenate	48.0%

21.2 Based on the acid number range specified for naphthenic acid in section 2.1 of AWPA Standard P8, the composition of the preservative present in waterborne copper naphthenate concentrate used to prepare treating solutions may vary within the following limits:

	Min.	Max.
Copper as Cu	4.5%	5.5%
Copper Naphthenate	37.0%	59.0%

21.3 The treating solution shall contain the reaction product of divalent copper with naphthenic acid meeting the requirements of Section 2.1 of AWPA Standard P8.

21.4 The copper naphthenate shall be dissolved in ethanolamine to give aqueous solutions within the pH range of 8 to 11. The weight of the ethanolamine in treating solutions shall be 0.67 ±0.20 times the weight of copper naphthenate to facilitate solubility.

21.5 Tests to establish conformity with the foregoing requirements shall be made in accordance with the applicable standard methods of the AWPA.

22. PROPICONAZOLE TEBUCONAZOLE IMIDACLOPRID (PTI) *(Adopted in 2008.)*

22.1 Propiconazole Tebuconazole Imidacloprid shall have the following composition:

Propiconazole	47.6%
Tebuconazole	47.6%
Imidacloprid	4.8%

Subject to tolerances listed in Paragraph 22.2. The above shall be emulsified in water.

22.2 The composition of the preservative present in the treating solution may vary with the following limits:

	Min.	Max.
Propiconazole	42.8%	52.4%
Tebuconazole	42.8%	52.4%
Imidacloprid	4.3%	5.3%

22.3 The commercial preservatives shall be labeled as to its total content of active ingredients listed in paragraph 22.1.

22.4 Tests to establish conformity with the foregoing requirements shall be made in accordance with the applicable standard methods of the AWPA. The composition of the treating solution may deviate outside the limits specified in paragraph 22.2 provided the preservative retention in the treated material is determined by assay and the retention so determined conforms to the minimum requirements listed in standard T1, Section 3, Tables 3.2a and 3.2b.

Notes:

[a] Acetic acid may be used, if desired, to adjust the pH of treating solution to conform to paragraph 10.1.

[b] The composition of treating solution in use may deviate outside the limits specified in Paragraphs 1.2, 3.2, 6.4, 12.2, 13.2, 14.2, 15.2, 17.2, and 18.2 provided: (a) The preservative retention in treated material is determined by assay and the retention so determined conforms to the requirements specified in the tables in Section 3 of AWPA Standard T1, and (b) Immediate action is taken to adjust the composition of the treating solution.

[c] Additional concentrate or chromic acid may be used if desired to adjust pH of treating solution to conform to paragraph 10.1.

STANDARD METHOD FOR DETERMINATION OF PROPICONAZOLE AND TEBUCONAZOLE IN WATERBORNE FORMULATIONS, AND IN TREATING SOLUTIONS BY HPLC

Jurisdiction: AWPA Subcommittee P-5
Initially adopted in 1999 and revised in 2001, 2005, and 2008.
This AWPA Standard is promulgated according to an open, consensus procedure.

1. Scope

This method is applicable to the quantitative determination of propiconazole and tebuconazole treating solutions. It could be used for the determination of propiconazole alone, tebuconazole alone, or a mixture of the two active ingredients. It requires utilization of High Performance Liquid Chromatography (HPLC).

2. Summary of method

The chromatographic method permits simultaneous determination of the active ingredients, propiconazole and tebuconazole in treating solutions. The active ingredients are separated and determined by HPLC using an UV detector. The concentration of the active ingredients is calculated using the external standard method with multi-level calibration.

3. Interferences

Inert ingredients in the formulation may be a source of interference. It is advised to run a blank formulation before performing quantitative determination. In case of interfering compounds, adaptation of the chromatographic conditions specified under section 9 could be necessary.

4. Safety precautions

No specific safety precautions should be observed. However, it is assumed that the analyst has received suitable training in carrying out chemical analysis. The analyst should also be acquainted with the potential hazards of the reagents, products, and solvents. Material Safety Data Sheets (MSDS) should be consulted before starting any laboratory work. Always follow general laboratory regulations governing safety measures, accident prevention and disposal of chemicals.

5. Apparatus

5.1 No special apparatus is required for sample preparation other than that commonly used for chemical analysis.

5.2 Analytical balance with 0.01 mg sensitivity.

5.3 Liquid chromatograph with a binary gradient elution capability. The column is a sequence of security guard column with C_{18} cartridge (ODS, 4 mm L x 3 mm I.D.) and 25 cm Phenomenex Nucleosil 120A (I.D. = 4.0 mm) filled with C_{18} (5 µm particle diameter). Note that the use of a guard column packed with the same type of material can lengthen the life of the column.

5.4 External column oven at 35°C

5.5 UV detector with a measuring wavelength of 225 nm.

5.6 Integrator or HPLC data station for data collection and quantification.

5.7 Ultrasonic bath.

6. Reagents

6.1 Water is of ultra pure grade. All other chemicals are of HPLC- or PA-grade.

6.2 Propiconazole analytical standard (available from Janssen Pharmaceutica NV).

6.3 Tebuconazole analytical standard (available from Bayer AG).

7. Preparation of standards

Warm the propiconazole 5 minutes at 80°C. Shake vigorously to insure homogeneity of the sample. Weigh (to the nearest 0.01 mg) 25 mg of propiconazole and 25 mg of tebuconazole in a 50 ml flask. If only one of the two active ingredients has to be determined, the stock solution is prepared with this active ingredient. Add to volume with the appropriate solvent (methanol for wood extract) to get a stock solution of about 500 mg/l. The purity of active ingredients should be known to accurately calculate the concentration of the stock solution. A set of standard solutions (at least four) is then prepared in the same solvent with concentrations typically ranging from 10 to 125 mg/l.

8. Preparation of samples

8.1 Dilute the treating solution with methanol in order to obtain a concentration of approximately 50 mg/l. Filter a representative part of the extract solution through a 0.45 µm filter before injection.

9. Chromatographic conditions

The flow rate is kept constant at 1.5 ml/min during the entire analysis. The detection is done at 225 nm. The oven temperature is 35 °C. The injection volume is 15 µl. The gradient conditions are described below.

Elution solvents:

A:aqueous solution of 0.5 %w/v $(NH_4)_2CO_3$

B: acetonitrile

Eluent composition in function of time

Time in min.	0	22.0	22.5	25.0	25.1	30
%A	57.5	57.5	10	10	57.5	57.5
%B	42.5	42.5	90	90	42.5	42.5

The duration of one run is 30 minutes. The retention times are 13.8 min for tebuconazole and 19.5 min for propiconazole (peak splitting will normally occur due to the presence of two diastereomers giving peaks at 19.5 and 20 min).

The chromatographic system must be re-equilibrated with the start conditions before performing another analysis (typical equilibration time is 5 minutes).

These chromatographic conditions are typical but not essential. As already mentioned, adaptation of some parameters (flow rate, injection volume, elution solvent, column temperature, etc.) may be necessary to avoid interference. Available equipment may also require adaptation of the prescribed method.

10. Standardization

Inject the standard solutions and calculate the peak areas. Propiconazole may give a peak splitting. In this case, the integrator peak-grouping mode should be used (adding the peak areas is also possible). Plot the peak areas of the standards (x-axis) vs. concentrations of active ingredients in mg/l (y-axis). Use linear regression analysis to determine the slope α, the intercept β and also the correlation coefficient. This latter parameter should be higher than 0.99 to justify the linear approximation. If not, linear regression should be applied on a smaller range of concentrations. In this case, the nominal concentration of each active ingredient in the solution to analyze should be situated within this linear calibration range. Another possibility is to apply a polynomial regression of order 2 or higher. If the calibration has a correlation coefficient greater than 0.99 and the intercept slope ratio is less than 2, a single point calibration may be used based on the highest concentration standard used. Single point calibration can be used for any sample solution with a concentration within the calibration range.

11. Calculations

11.1 Concentration of active ingredients

Calculate the concentration of active ingredients C_i, in mg/l from the peak area P_i:

$$C_i = \alpha P_i + \beta$$

where:

α is the slope of the linear regression

β is the intercept (see § 10).

11.2 Treating solutions

The concentration (retention) of active ingredient in the treating solution is easily calculated via the equation:

$$mg\ \ a.i./l\ \ treating\ \ \ solution\ \ = \frac{C_i V_d}{V_s}$$

where:

C_i is the concentration obtained with the calibration solutions (as explained in 11.1)

V_d is the volume of solvent (expressed in milliliters) used to dilute the treating solution sample

V_s is the amount (expressed in milliliters) of treating solution used.

12. Precision Statement

12.1 The following statements and table should be used to judge the acceptability of an analysis using the method under the conditions below. The precision of the data were developed following the guidelines in ASTM Method E691.

Repeatability: Triplicate single determinations on the same sample by the same operator using the same equipment should not be suspect at the 95% confidence level if they do not differ from one another by equal or less than the limiting percentages shown in the following table.

Reproducibility: Duplicate single sample determinations on the same sample by different operators in different laboratories should not be suspect at the 95% confidence level if they do not differ from one another by equal to or less than the limiting percentages shown in the following table.

Range of Propiconazole (ppm)	Confidence Limits %	
	Repeatability	Reproducibility
500	0.0016	0.0059
1000	0.0052	0.0111
2500	0.0106	0.0288
5000	0.0226	0.0612

STANDARD METHODS FOR THE ANALYSIS OF SOLUTIONS AND WOOD FOR AZOLES BY GAS CHROMATOGRAPHY (GC)

Jurisdiction: AWPA Subcommittee P-5
Initially adopted in 2001 and amended in 2002, 2003, 2005, and 2006.
This AWPA Standard is promulgated according to an open, consensus procedure.

1. Scope

This method provides a gas chromatography (GC) analysis of azoles in aqueous solutions and in wood. The azoles included in this method consist of propiconazole, tebuconazole and tebuconazole in Copper Azole Type A (CBA-A) and Type B (CA-B).

2. Summary of Method

2.1 Aqueous solutions of propiconazole and tebuconazole are diluted with methanol and determined by GC using the external standard method with multilevel calibration. For CBA-A and CA-B, separation of the tebuconazole from the inorganic portions of the preservative is recommended prior to GC analysis. One method is to use a C-18 extraction column, which binds the tebuconazole but allows the aqueous, inorganic materials to pass through. Tebuconazole is removed from the column using an organic solvent, acetonitrile. An alternative method is to use an amino extraction column to remove the copper from a diluted solution.

2.2 For extraction of propiconazole or tebuconazole from treated wood, two procedures may be used. One requires a refluxing methanol extraction procedure (Procedure 8.2.1), while the second uses an ultrasonic bath to extract the azole from wood (Procedure 8.2.2).

3. Interferences

Interference is minimized using this methodology. For the aqueous solutions of CBA-A and CA-B, the inorganic portion of the preservative system is separated from the tebuconazole by a solid phase extraction operation. For analysis of wood samples, wood extractives frequently interfere with many other methodologies; however, this method uses a Thermionic Specific Detector (TSD) so that interferences are minimized.

4. Safety Precautions

Methanol is used extensively in this procedure. Methanol is highly flammable and toxic by inhalation. Appropriate safe laboratory practices should be observed at all times. Personnel involved must have sufficient training and experience in the analytical laboratory.

5. Apparatus

The standard laboratory volumetric equipment, 10x100 mm test tubes or 16x100 mm test tubes with caps, an analytical balance, an oven, and a gas chromatograph (temperature programable fitted with capillary split/splitless injector and thermionic - nitrogen/phosphorus – detector, with data acquisition/sampling software) are required. For the specific samples, the following apparatus is recommended:

5.1 For the extraction of tebuconazole from aqueous solutions of CBA-A and CA-B, the following is recommended: Procedure 8.1.1) solid phase extraction column (J.T. Baker 7020-13 Octadecyl), 10 cc plastic syringes, Tygon tubing 3/8", 12 position vacuum manifold (Baxter 9400) and a vacuum pump or water aspirator; Procedure 8.2.2) solid phase extraction column (J.T. Baker 7088-03 Amino), single sample SPE processor (Supelco 57080-U).

5.2 To extract propiconazole or tebuconazole from wood meal or sawdust, the following equipment is recommended: Procedure 8.2.1 — round or flat bottom flasks and condensers (fitted with ground glass joints, e.g. 24/40), heating mantles, powerstats and glass beads or boil easers; Procedure 8.2.2 an ultrasonic bath capable of maintaining a temperature of 55°C, 0.45µm filters disks and 10 cc syringes.

6. Reagents

Propiconazole, tebuconazole and azaconazole standards are required for both analysis of solutions and treated wood samples.

6.1 For the solution samples, HPLC grade methanol, acetonitrile and water (or deionized water) is required.

6.2 For wood samples, HPLC grade methanol is required.

7. Sampling

7.1 For solutions, place a representative sample of at least 100 ml in a clean, dry storage bottle and seal. Do not store in direct sunlight.

7.2 Select representative samples from the treated wood source and reduce size to either sawdust or wood meal via Wiley mill or other grinding device. Dry samples at 105°C to constant weight.

8. Preparation of Samples

8.1 Solution Samples. For solutions of tebuconazole or propiconazole, weigh an amount of sample into a volumetric flask such that about 120 mg/L of either propiconazole or tebuconazole is contained in the final volume. Dilute to the mark with HPLC grade methanol. Add a 1000 ppm azaconazole internal standard at the rate of 20µL/mL of solution.

If CBA-A or CA-B solutions are to be analyzed, then azole analysis can be performed using either of the following methods.

8.1.1 Solid Phase Extraction of Tebuconazole. Activate column active sites by measuring 10 ml of HPLC grade methanol into a syringe and dispensing the solvent onto the column bed. Allow the solvent to go to waste. Once the column has been activated, it must not be allowed to dry out at any stage prior to adsorption of the analyte. Therefore, stop the flow of liquid once the liquid meniscus reaches the top of the column bed. Rinse the methanol from column with two 10 ml aliquots of deionized water or HPLC grade water. Pass a weighed amount of CBA-A or CA-B containing solution slowly through the column. Rinse the column three times with 10 ml of deionized or HPLC grade water to remove any water-soluble interferents (copper or boric acid) and discard. Slowly extract the analyte from the column with a known volume of acetonitrile, typically 10 ml, and collect the eluent in a test tube or vial. A 1000 ppm azaconazole internal standard should be added to the eluent at the rate of 20µL/mL of solution.

8.1.2 Dilution and Extraction of Copper. Weigh an amount of CBA-A or CA-B solution into a volumetric flask. Dilute to volume with HPLC grade methanol such that the final volume is within the range of the GC calibration standards. Add a 1000 ppm azaconazole internal standard to the solution at the rate of 20 µL/mL. Cap the flask and invert several times to thoroughly mix the solution. Fill the amino SPE column with the methanol solution and insert the single sample processor. Depress the plunger and dispense the eluent into an autosampler vial or other container.

8.2 Wood Samples. There are two procedures for extracting the azole from treated wood. Both require that the sample be prepared according to section 7.2.

8.2.1 Extraction by Reflux. Weigh approximately 2.0 g of sample to the nearest 0.1 mg and place in a round bottom flask along with glass beads or boil easers. Add about 50 ml of methanol and attach to a water-cooled condenser. Allow the methanol to reflux for 30 minutes, and decant the extract into a separate flask. Repeat this process two additional times. Combine the extracts and correct (evaporate) to 100 ml in a volumetric flask. A 1000 ppm azaconazole internal standard should be added to the extract at the rate of 20 µL internal standard/ mL of solution.

8.2.2 Extraction by Ultrasonic Bath[1]. Obtain a tare weight on a test tube and cap. Weigh approximately 0.50 g of sample to the nearest 0.1 mg and quantitatively transfer to the test tube. Add 10 mL of HPLC grade methanol to the test tube and cap. Place the test tube in an ultrasonic bath that has been preheated to 55°C and sonicate for 3 hours. Remove the sample at 30 minute intervals and shake vigorously. It may be necessary to carefully vent the cap to remove any pressure build-up within the test tube. After 3 hours, remove the sample and dry the test tube with a lint-free cloth. Allow it to cool and then reweigh the contents. The final weight of methanol can then be determined by subtracting the weight of the test tube, cap and sample. Remove any wood particulate from the extract using a 0.45µm filter disk and 10 cc syringe. Prior to GC analysis, a 1000 ppm azaconazole standard should be added to the extract at the rate of 20 µL/mL

[1] An ultrasonic bath of sufficient power and capacity is required to extract the wood samples in the specified time. If complete extraction is uncertain due to equipment used, individual labs should perform their own study to determine if their ultrasonic bath power and capacity as well as extraction duration time is adequate.

9. Standard Solutions

9.1 Calibration standards. Standards for instrument calibration should be prepared using tebuconazole and propiconazole of known purity. Prepare a 1000 ppm stock solution of each. Using A grade pipets and volumetric flasks, prepare standard solutions of tebuconazole and propiconazole from the 1000 ppm stock solution to give the appropriate concentration ranges. Typical standard concentrations are 25, 50, 100, 150 and 200 ppm azole.

9.2 Internal standard. Azaconazole is used as an internal standard to insure accuracy of results. A 1000 ppm azaconazole stock solution should be prepared and added to all standards and samples at the rate of 20µL/mL of solution.

10. Operation of Gas Chromatograph

The GC should be operated and maintained in accordance with the manufacturer's recommendations. The configuration of the instrument is:

Injector	Split/Splitless @ 250 °C, using silanised glass insert with silanized quartz wool and low bleed silicone septa. 1 µL splitless injection. Vent valve open @ 1 minute.
Detector	Thermionic: Nitrogen/Phosphorus (NPD) @ 280 °C.
Column	SGE BPX-35, 25 m, 0.32 mm ID, 0.25 µm film, fitted with a 500 mm section of deactivated silica tubing as a retention gap.
Carrier Gas	Helium U.H.P @ 14.8 psig (program start conditions). Split Flow @ 50 ml/min.
Oven	Initial temperature @ 100 °C Hold for 1 minute. 15 °C/min to 260 °C. Hold for 5 minutes.
Integrator Software	Integrator or data acquisition system capable of performing internal standard type calibration and quantitative analysis.

11. Standardization

Inject the reference and sample solutions and calculate the peak areas. In case of peak splitting (propiconazole is a mixture of diastereomers) use peak grouping, mode for the integrator or add peaks areas. To obtain the calibration curve, perform a linear regression on the ratio of As/Ais versus concentration of tebuconazole or propiconazole (Cs). This will give you a formula in the following form:

As/Ais = mCs +b *[Equation 1]*

where
As = area of sample peak
Ais = area of internal standard peak
Cs = tebuconazole or propiconazole concentration (mg/L)
m = slope
b = intercept

12. Calculation

12.1 Solution Samples. The propiconazole and tebuconazole in solution (Cs) can be calculated in mg/L using the equation:

$$Cs = \frac{As / Ais - b}{m} \qquad \textit{[Equation 2]}$$

Calculate the concentration of the azole in each treating solution sample using Equation 3:

$$ppm = \frac{Cs\,x\,V}{W} \qquad \textit{[Equation 3]}$$

$$\%\ w/w = \frac{Cs\,x\,V}{W\,x10000} \qquad \textit{[Equation 4]}$$

W = weight of the sample in the solution (g).
V = volume of acetonitrile or methanol (mL)

12.2 Wood Samples. The azole concentration (Cs) is determined using Equation 2 above. The concentration of the azole in the treated wood sample is calculated using Equations 5 and 6. If Procedure 8.2.2 was used, then the weight of methanol must be divided by its density, 0.7924 g/mL, to obtain the final volume of methanol.

$$ppm = \frac{Cs\,x\,V}{W} \qquad \textit{[Equation 5]}$$

$$\%\ w/w = \frac{Cs\,x\,V}{W} \qquad \textit{[Equation 6]}$$

V = final volume of methanol (mL).
W = weight of wood sample (g).

13. Precision Statement

The following statements and tables should be used to judge the acceptability of an analysis using the described method and the conditions below. The precision data were developed following the ASTM E-691 for aqueous solutions of Copper Azole – Type A (CBA-A) and Type B (CA-B), Propiconazole and Tebuconazole, using 6 laboratories, 4 samples and two replicates.

13.1Repeatability: Duplicate single determinations on the same sample by the same operator using the same equipment should not be suspect at the 95% confidence level, if they do not differ from one another by equal to or less than the limiting percent levels shown in the following tables.

13.2 Reproducibility: Duplicate single determinations on the same sample by different operators in different laboratories should not be suspect at the 95% confidence level if they do not differ from one another by equal to or less than the limiting ppm shown in the following tables.

13.3 Precision Statements for Methods 8.1 and 8.1.1

	Confidence Limits	
Concentration, %	Repeatability (r)	Reproducibility (R)
Range Tebuconazole in Copper Azole – Type A		
0.010	0.0015	0.0039
0.020	0.0044	0.013
0.030	0.0024	0.0072
0.040	0.0042	0.014
Range of Propiconazole		
0.040	0.0015	0.0080
0.10	0.0065	0.013
0.20	0.019	0.040
0.40	0.040	0.085
Range of Tebuconazole		
0.040	0.0021	0.0088
0.10	0.0050	0.024
0.20	0.0072	0.034
0.40	0.026	0.087

13.4 Precision Statement for Method 8.2.1 Extraction by Reflux

	Confidence Limits, wt %	
Concentration, wt%	*Repeatability (r)*	*Reproducibility (R)*
Range Tebuconazole in Copper Azole – Type B		
0.0074	*0.00092*	*0.0034*
0.013	*0.0011*	*0.011*
0.017	*0.0026*	*0.015*
0.020	*0.0030*	*0.013*

13.5Precision Statement for Method 8.2.2 Extraction by Ultrasonic Bath

	Confidence Limits, wt %	
Concentration, wt %	*Repeatability (r)*	*Reproducibility (R)*
Range Tebuconazole in Copper Azole – Type B		
0.0077	*0.0013*	*0.0014*
0.014	*0.0011*	*0.0044*
0.018	*0.0032*	*0.0050*
0.020	*0.0025*	*0.0038*

14. References

"Gas Chromatographic Determination of Cyprodinil, Fludioxonil, Pyrimethal, and Tebuconazole in Grapes, Must, and Wine"; Cabras, E., Angioni A., Garau V., Minelli E. (1997) Journal of AOAC International 80 (4), 867-869.

Analysis of tebuconazole in wood treated with tanalith E, Ferlazzo, D. E. (1999) The International Research Group on Wood Preservation, Stockholm, Doc. No. IRG/WP 99-20158.

Osmose®

May 28, 2009

Mr. Alan D. Rawson, PE
Chairman, Tech Section 4c Committee
Division 4: General Manufactured Materials
AASHTO – Subcommittee on Materials

RE: AASHTO Designation: M 133-09 Standard Specification for Preservatives and Pressure Treatment Processes for Timber

Dear Mr. Rawson and Committee members:

We are hereby submitting a formal request to revise sections 5.2 and 8.1 of the above referenced specification M 133-09. The revision is to add *Micronized Copper Azole* an ICC-ES evaluated preservative system that was first introduced in 2007 and has been gaining wide acceptance in the pressure treated wood market.

Osmose, Inc. is one of three manufacturers that have ICC-ES Evaluation Reports for this type preservative system listed on the website www.icc-es.org Osmose's micronized copper azole system (LifeWood®) is on ICC-ES Evaluation Report ESR-2240, a copy of which is attached. Compliance to AC326 is stated in section 6.0 Evidence Submitted.

The proposed revisions would be to add the following to specification M 133-09

5.2.2 Micronized Copper Azole

8.1.16 add Micronized Copper Azole to those already listed

We are also attaching a copy of ESR-1980 for *Micronized Copper Quaternary* which as you know was approved by AASHTO last year for inclusion in M 133-09. We respectfully request that the proposed change to specification M 133-09 be granted. Let us know if you require anything further and we thank you for your consideration.

Yours truly,

Robert K. Wangel (RW)

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Gregory F. Goergen
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Acceptance

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DIVISION: 06—WOOD AND PLASTICS
Section: 06070—Wood Treatment

REPORT HOLDER:

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EVALUATION SUBJECT:

OSMOSE LIFEWOOD® PRESERVATIVE-TREATED WOOD

ADDITIONAL LISTEES:

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BIEWER OF LANSING LLC
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LANSING, MICHIGAN 48917
(517) 322-3835

COASTAL TREATED PRODUCTS COMPANY
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COMMONWEALTH WOOD PRESERVERS
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CULPEPER WOOD PRESERVERS
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FORTRESS WOOD PRODUCTS
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MARTINSVILLE, VIRGINIA 24115
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GREAT SOUTHERN WOOD PRESERVING
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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Preservative-treated wood
- Decay resistance
- Termite resistance
- Corrosion
- Structural

2.0 USES

Osmose LifeWood® preservative-treated wood is used in applications that are required by the code to be protected against decay and termites.

3.0 DESCRIPTION

3.1 General:

LifeWood® preservative-treated wood products are recognized for use in aboveground, ground-contact (general use and critical structural), and freshwater-contact applications and to resist attack by fungal decay, and subterranean termites, including Formosan termites.

The preservatives to treat LifeWood® are produced by Osmose, Inc., and are used by the wood-preserving treatment facilities listed in Table 3 of this report to preservative-treat wood products in accordance with the Osmose, Inc., Standard MCA.

3.2 Preservative System:

LifeWood® brand wood is treated with a copper and azole preservative system. The preservative includes specified ingredients of micronized copper and tebuconazole. The active micronized copper expressed as copper metal (Cu) to azole (tebuconazole) in the wood preservative is in a ratio of 25:1.

3.3 Materials:

LifeWood® preservative-treated wood materials may consist of the following:

a. Dimensional lumber and timbers of the following species consisting of primarily sapwood: southern pine, mixed southern pine, radiata pine, Caribbean pine, red pine, Ponderosa pine, and German Scots pine.

b. Dimensional lumber of the following species consisting primarily of heartwood: hem-fir.

c. Lumber, of nominal size of 2-by-8 or less, for decking and specialty use of the species listed in (a) and (b) above.

d. Southern pine and Douglas fir plywood.

Minimum preservative retention levels must comply with the values shown in Table 1 of this evaluation report.

4.0 INSTALLATION

4.1 General:

LifeWood® preservative-treated wood is installed as preservative-treated lumber and timbers in accordance with the requirements of the applicable code.

Osmose, Inc., and industry published installation instructions for wood and pressure-treated wood and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

The instructions within this report govern if there are any conflicts between Osmose, Inc., instructions and this report.

4.2 Applications:

LifeWood® preservative-treated wood products may be used in locations where wood is permitted and/or in locations required by the code to be fungal decay or termite resistant in all building types and occupancies where permitted by the applicable code. Typical applications are described in Table 2.

Locations requiring preservative-treated wood for fungal decay or termite resistance are described in Section 2304.11 of the IBC and Sections R319 and R320 of the IRC.

4.3 Fasteners:

Fasteners used with LifeWood® preservative-treated wood products must be in accordance with Section 2304.9.5 of the IBC and Section R319.3 of the IRC, except that aluminum fasteners are also permitted.

4.4 Structural:

4.4.1 Duration of Load: The maximum load duration factor allowed for LifeWood® treated wood products used for structural members is 1.6, in accordance with Section 2.3 of the American Forest & Paper Association (AF&PA) National Design Specification for Wood Construction (NDS).

4.4.2 Incising Factor: When the treated wood products have been incised, the reference design values must be multiplied by the incising factor, Ci, in accordance with Section 4.3.8 of the NDS.

5.0 CONDITIONS OF USE

The LifeWood® preservative-treated wood products described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Use of the preservative-treated wood is limited to the types of applications noted in Section 4.2.

5.2 Surface treatment of field cuts must be in accordance with the recommendations of Osmose, Inc.

5.3 The LifeWood® preservative-treated wood products are limited to the wood species noted in Section 3.3 and the minimum retention levels noted in Table 1.

5.4 Treatment of wood products is at the facilities of the treaters noted in Table 3, under a quality control program with inspections by Timber Products Inspection Inc. (AA-664 and AA-696) or Southern Pine Inspection Bureau, Inc. (AA-680).

6.0 EVIDENCE SUBMITTED

Data in accordance with Appendix A, Copper-Azole Wood-Preservative Treatment Systems (Formerly AC143), of the ICC-ES Acceptance Criteria for Proprietary Wood Preservative Systems-Common Requirements for Treatment Process, Test Methods and Performance (AC326), dated November 2008.

7.0 IDENTIFICATION

LifeWood® preservative-treated wood products must be labeled in accordance with AC326, the name of the inspection agency (Timber Products Inspection Inc. or Southern Pine Inspection Bureau, Inc.); the product name (LifeWood®) or logo (see Figure 1); the treatment company name and plant location (refer to Table 3); the names of the preservative components; the intended end use; minimum retention; and the evaluation report number (ESR-2240). A sample label is shown as Figure 1. For optional sample label information, refer to Section 6.8.1 of AC326.

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following legacy codes and earlier editions of the International Codes:

- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IRC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*© (SBC)

The LifeWood® preservative-treated wood products described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.1 through 8.6.

8.1 Uses:

See Section 2.0.

8.2 Description:

See Section 3.0.

8.3 Installation:

See Section 4.0, except for the following modifications:

Locations requiring preservative-treated wood for decay or termite resistance are described in Section 2304.11 of the 2000 and 2003 IBC, Sections R323 and R324 of the 2000 IRC, Sections R319 and R320 of the 2003 IRC, Section 2304 of the SBC, Section 2311 of the BNBC, and Section 2306 of the UBC.

Fasteners used with LifeWood® preservative-treated wood products must be in accordance with Section 2304.9.5 of the 2000 and 2003 IBC, Section R323.3 of the 2000 IRC, Section R319.3 of the 2003 IRC, Section 2306.3 of the SBC, Section 2311.3.3 of the BNBC, and Section 2304.3 of the UBC, except that aluminum fasteners are also permitted.

8.4 Conditions of Use:

See Section 5.0.

8.5 Evidence Submitted:

See Section 6.0.

8.6 Identification:

See Section 7.0.

TABLE 1—MINIMM PRESERVATIVE RETENTION REQUIREMENTS FOR OSMOSE LifeWood® WOOD PRODUCTS BY END USE

END USE	MINIMUM TOTAL RETENTION[1, 2], pcf (kg/m³)
Above ground	0.06 (1.0)
Ground contact—General Use	0.15 (2.4)
Ground contact—Critical Structural	0.23 (3.7)

[1]Retention is expressed in pounds of preservative per cubic foot (kilograms per cubic meter) of preservative actives.
[2]Minimum active component retentions of Cu and azole are noted in the Osmose, Inc., Standard MCA.

TABLE 2—TYPICAL APPLICATIONS FOR OSMOSE LifeWood® WOOD PRODUCTS

SERVICE CONDITIONS	AWPA USE CATEGORY	TYPICAL APPLICATIONS
Interior construction, above ground, dry	UC1	Interior construction - millwork and furnishings
Interior construction, above ground, damp	UC2	Interior construction - interior beams, timbers, flooring millwork and sill plates
Exterior construction, above ground, coated and rapid water runoff	UC3A	Exterior - coated millwork, siding and trim
Exterior construction, above ground, uncoated and poor water runoff	UC3B	Decking, guardrails, spindles, flooring, deck joists, beams and framing, deck posts above grade support on concrete piers with a steel bracket, trim and fascia, sill plates, fence rails, trellises, gazebos
Ground contact - general use	UC4A	Deck support posts, fence posts, retaining walls
Ground contact - critical structural	UC4B	Permanent wood foundations, sawn and round building poles

TABLE 3—WOOD PRESERVATIVE TREATMENT LOCATIONS

LISTEES	WOOD PRESERVATIVE TREATMENT LOCATIONS
Aljoma Lumber, Inc.	Medley, FL
BB&S Treated Lumber of New England	North Kingstown, RI
Biewer of Lansing LLC	Lansing, MI
Coastal Treated Products Company	Havana, FL Weldon, NC Oxford, PA
Commonwealth Wood Preservers	Hampton, VA
Culpeper Wood Preservers	Streator, IL Shelbyville, IN
Fortress Wood Products	Greensboro, NC
Great Southern Wood Preserving	Conyers, GA Abbeville, AL Irvington, AL
Great Southern Wood - Buckner, Inc.	Buckner, MO
Great Southern Wood - Bushnell, Inc.	Bushnell, FL
Great Southern Wood - Columbus, Inc.	Columbus, TX
Great Southern Wood - Glenwood, Inc.	Glenwood, AR
Great Southern Wood - Jesup, Inc.	Jesup, GA
Great Southern Wood - Tuscumbia, Inc.	Tuscumbia, AL
Hixson Lumber Sales	Magnolia, AR Pine Bluff, AR Plumerville, AR Hillsboro, IL Caddo Mills, TX Willis, TX
Innovative Pine Technology/Lake States	Duluth, MN
John A. Biewer Company of Illinois	Seneca, IL
John A. Biewer Company of Wisconsin	Prentice, WI
New South Wood Preserving LLC	Camden, SC Conway, SC
Perry Logistics dba Fortress Wood Products	Henderson, NC
United Wood Preserving LLC	Muscle Shoals, AL
Universal Forest Products Eastern Division, Inc.	Moultrie, GA Union City, GA Salisbury, NC Auburndale, FL Granger, IN Janesville, WI Belchertown, MA Ranson, WV Stockertown, PA Elizabeth City, NC Lodi, OH Blanchester, OH Lansing, MI
Universal Forest Products Western Division, Inc.	Windsor, CO Saginwa, TX Harrisonville, MO Schertz, TX New Waverly, TX Silsbee, TX White Bear Lake, MN
Western Wood Preserving Company	Sumner, WA

TABLE 4—LISTEES AND PRIVATE BRAND NAMES FOR LIFEWOOD® PRESERVATIVE TREATED WOOD

COMPANY	PRIVATE BRAND NAME
Osmose, Inc.	LifeWood®
Aljoma Lumber, Inc.	LifeWood®
BB&S Treated Lumber of New England	LifeWood®
Biewer of Lansing LLC	Everguard
Coastal Treated Products Company	LifeWood®
Commonwealth Wood Preservers	LifeWood®
Culpeper Wood Preservers	LifeWood®
Fortress Wood Products	LifeWood®
Great Southern Wood Preserving	Yella Wood
Great Southern Wood - Buckner, Inc.	Yella Wood
Great Southern Wood - Bushnell, Inc.	Yella Wood
Great Southern Wood - Columbus, Inc.	Yella Wood
Great Southern Wood - Glenwood, Inc.	Yella Wood
Great Southern Wood - Jesup, Inc.	Yella Wood
Great Southern Wood - Tuscumbia, Inc.	Yella Wood
Hixson Lumber Sales	LifeWood®
Innovative Pine Technology/Lake States	XGUARD
John A. Biewer Company of Illinois	Everguard
John A. Biewer Company of Wisconsin	Everguard
New South Wood Preserving LLC	Gator Guard
Perry Logistics dba Fortress Wood Products	LifeWood®
United Wood Preserving LLC	LifeWood®
Universal Forest Products Eastern Division, Inc.	ProWood® Micro CA
Universal Forest Products Western Division, Inc.	ProWood® Micro CA
Western Wood Preserving Company	LifeWood®

LifeWood® Sample Label

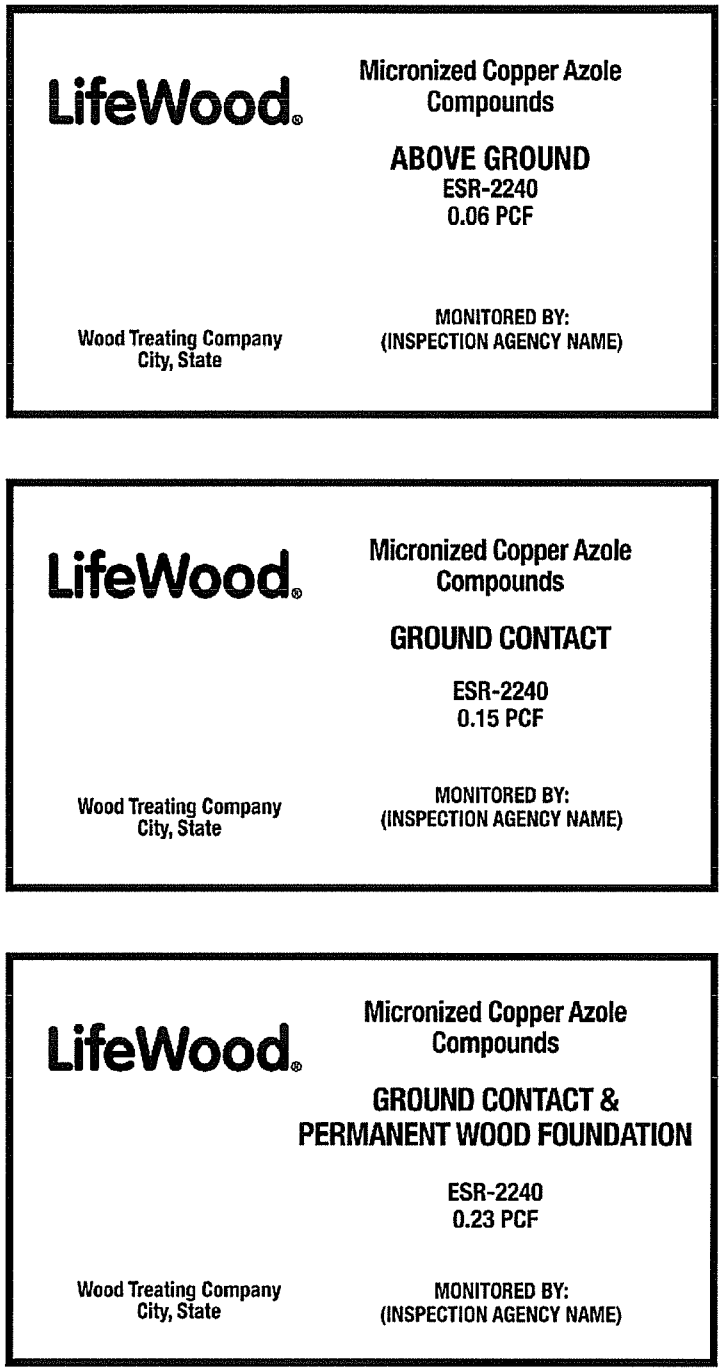

FIGURE 1—SAMPLE PRODUCT LABEL
(Product must also be labeled with the minimum retention as specified in Table 1)

ICC-ES Evaluation Report

ESR-1980*

Reissued May 1, 2008

This report is subject to re-examination in one year.

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DIVISION: 06—WOOD AND PLASTICS
SECTION: 06070—WOOD TREATMENT

REPORT HOLDER:

OSMOSE, INCORPORATED
1016 EVEREE INN ROAD
GRIFFIN, GEORGIA 30224-0249
(770) 223-4200
www.osmose.com

EVALUATION SUBJECT:

NATUREWOOD® AND MICROPRO™/SMART SENSE® PRESSURE TREATED WOOD

ADDITIONAL LISTEES:

ALABAMA–GEORGIA WOOD PRESERVERS COMPANY
POST OFFICE DRAWER 9
LAFAYETTE, ALABAMA 36863-0009

ALJOMA LUMBER, INC.
10300 NORTHWEST 121 WAY
MEDLEY, FLORIDA 33178

ANTHONY WOOD TREATING, INC.
300 GUNTER STREET
HOPE, ARKANSAS 71802

BB&S TREATED LUMBER OF NEW ENGLAND
61 BONNEAU ROAD
NORTH KINGSTOWN, RHODE ISLAND 02852

BIEWER OF LANSING, LLC
6111 WEST MOUNT HOPE HIGHWAY
LANSING, MICHIGAN 48917

JOHN A. BIEWER COMPANY OF WISCONSIN
400 RED PINE COURT
PRENTICE, WISCONSIN 54556

BRACKETT BROTHERS CORPORATION
4875 BRACKETT LYLES DRIVE
MORGANTON, NORTH CAROLINA 28655

C.M. TUCKER LUMBER COMPANIES, LLC
POST OFFICE BOX 7
PAGELAND, SOUTH CAROLINA 29728-0007

CALIFORNIA CASCADE FONTANA, INC.
8395 SULTANA AVENUE
FONTANA, CALIFORNIA 92335

COASTAL TREATED PRODUCTS COMPANY
POST OFFICE BOX 829
WELDON, NORTH CAROLINA 27890

COLLUM'S LUMBER MILL, INC.
POST OFFICE BOX 535
ALLENDALE, SOUTH CAROLINA 29810-0535

COLONIE WOOD TREATING & STAIN
70 FULLER ROAD
ALBANY, NEW YORK 12205

COLUMBUS LUMBER COMPANY
810 W. L. BEHAN ROAD
BROOKHAVEN, MISSISSIPPI 39601

COMMERCIAL LUMBER COMPANY
102 OAKLEY DRIVE
NORTH LITTLE ROCK, ARKANSAS 72114

COMMONWEALTH WOOD PRESERVERS
5604 CITY LINE ROAD
HAMPTON, VIRGINIA 23661

CONASAUGA WOOD PRESERVERS
HIGHWAY 411
CONASAUGA, TENNESSEE 37316

CULPEPER WOOD PRESERVERS
POST OFFICE BOX 260
SHELBYVILLE, INDIANA 46176

D & D WOOD PRESERVING, INC.
POST OFFICE BOX 1802
ALBANY, GEORGIA 31702-1802

DAVIS BROTHERS' LUMBER COMPANY
299 RICHLAND ROAD
RICHLAND, SOUTH CAROLINA 29675

EASTEX FOREST PRODUCTS
5429 HARTWICK ROAD
HOUSTON, TEXAS 77093

ELDER WOOD PRESERVING CO.
334 ELDER WOOD ROAD
MANSURA, LOUISIANA 71350

*Revised February 2009

FORTRESS WOOD PRODUCTS
POST OFFICE DRAWER 4991
MARTINSVILLE, VIRGINIA 24115

GREAT SOUTHERN WOOD PRESERVING, INC.
POST OFFICE BOX 610
ABBEVILLE, ALABAMA 36310

GREAT SOUTHERN WOOD–TUSCUMBIA, INC.
POST OFFICE BOX 2739
MUSCLE SHOALS, ALABAMA 35662

GREAT SOUTHERN WOOD–BUSHNELL, INC.
POST OFFICE BOX 759
BUSHNELL, FLORIDA 33513-0759

GREAT SOUTHERN WOOD–JESUP, INC.
2505 SOUTH MACON STREET
JESUP, GEORGIA 31545

GREAT SOUTHERN WOOD–COLUMBUS, INC.
POST OFFICE BOX 460
COLUMBUS, TEXAS 78934

GREAT SOUTHERN WOOD–BUCKNER, INC.
1320 EAST OLD LEXINGTON ROAD
BUCKNER, MISSOURI 65016

GREAT SOUTHERN WOOD–GLENWOOD, INC.
400 SOUTH SPUR 8
GLENWOOD, ARKANSAS 71943

GREAT SOUTHERN WOOD–MT. PLEASANT, INC.
2993 COUNTY ROAD 3210
MT. PLEASANT, TEXAS 75455

GULF TREATING, INC.
POST OFFICE BOX 1663
MOBILE, ALABAMA 36633

HILLS PRODUCT GROUP
1-90, OFF WHITEWOOD EXIT
WHITEWOOD, SOUTH DAKOTA 57793

HIXSON LUMBER SALES, INC.
POST OFFICE BOX 1466
MAGNOLIA, ARKANSAS 71753

HOOVER TREATED WOOD PRODUCTS
1742 WARRENTON HIGHWAY, NW
THOMSON, GEORGIA 30824

INNOVATIVE PINE TECHNOLOGY/LAKE STATES
1102 PORT TERMINAL DRIVE
DULUTH, MINNESOTA 55802

LAND O LAKES WOOD PRESERVING COMPANY
HIGHWAY 71
TENSTRIKE, MINNESOTA 56683

LAND & SEA FOREST PRODUCTS
400 ROCK RUN ROAD
FAIRLESS HILLS, PENNSYLVANIA 19030

MG BUILDING MATERIALS
9501 HIGHWAY 81 SOUTH
SAN ANTONIO, TEXAS 78211

MAINE WOOD TREATERS
WALKER ROAD
MECHANIC FALLS, MAINE 04256

MIDWEST MANUFACTURING
5231 KANE ROAD
EAU CLAIRE, WISCONSIN 54703-9624

MIDWEST MANUFACTURING
14317 COUNTY ROAD 15
PIONEER, OHIO 43554

NEW SOUTH WOOD PRESERVING, LLC
POST OFFICE DRAWER 1505
CONWAY, SOUTH CAROLINA 29526-2601

POTOMAC SUPPLY CORPORATION
1398 KINSALE ROAD
KINSALE, VIRGINIA 22488

SHENANDOAH WOOD PRESERVERS, INC.
301 EAST 16TH STREET
SCOTLAND NECK, NORTH CAROLINA 27874

SIMMONS WOOD PRODUCTS, INC.
6501 BROADWAY SOUTHEAST
ALBUQUERQUE, NEW MEXICO 87105

S. I. STOREY LUMBER COMPANY
285 STOREY ROAD NORTHWEST
ARMUCHEE, GEORGIA 30105

STEINKAMP WAREHOUSE, INC.
1000 NORTH MAIN STREET HIGHWAY 321
HUNTINGBURG, INDIANA 47542

STRAITS WOOD TREATING
4804 EAST WILDER ROAD
BAY CITY, MICHIGAN 48706

THRIFT BROTHERS LUMBER, INC.
111 TOCCOA HIGHWAY
WESTMINSTER, SOUTH CAROLINA 29693

THOMAS WOOD PRESERVING COMPANY
1964 MURF DRIVE
ELLIOTT, MISSISSIPPI 38926

TOMBALL FOREST PRODUCTS
42511 OLD HOUSTON HIGHWAY
WALLER, TEXAS 77484

TRUEGUARD, LLC
725 SOUTH 32ND STREET
WASHOUGAL, WASHINGTON 98671

UNITED WOOD PRESERVING, LLC
338-D WASHINGTON AVENUE
MUSCLE SHOALS, ALABAMA 35661

UNIVERSAL FOREST PRODUCTS
2801 EAST BELTLINE, NORTHEAST
GRAND RAPIDS, MICHIGAN 49525

WESTERN WOOD PRESERVING COMPANY
1313 ZEHNDER STREET
SUMNER, WASHINGTON 98390

WESTERN WOOD TREATING, INC.
1492 CHURCHILL DOWNS ROAD
WOODLAND, CALIFORNIA 95776

WOOD PROTECTION LP
POST OFFICE BOX 330376
HOUSTON, TEXAS 77233-0376

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- Other Codes (see Section 8.0)

Properties evaluated:

- Preservative-treated wood
- Decay resistance
- Termite resistance
- Corrosion
- Structural

2.0 USES

NatureWood® and MicroPro™/Smart Sense® preservative-treated wood is used for wood members that are required by the code to be protected against decay and termites.

3.0 DESCRIPTION

3.1 General:

NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products are recognized for use in aboveground, ground-contact, and freshwater contact applications to resist attack by fungal decay and subterranean termites, including Formosan termites.

NatureWood® and MicroPro™/Smart Sense® wood preservatives are produced by Osmose, Inc., and are used by the wood-preservative treatment facilities listed in Table 3 of this report to preservative-treat wood products, in accordance with the following, as applicable:

a. Standard MP-SS-01, Osmose, Inc., Quality Control Manual for MicroPro™/Smart Sense® Pressure-Treated Wood Products.

b. Standard NW-01, Quality Control Procedures for Osmose, Inc., NatureWood® Brand Pressure Treated Wood Products.

c. Standard NW-DECK-01, Quality Control Procedures for Osmose, Inc., NatureWood® Brand Pressure Treated Wood Decking.

3.2 Preservative System:

NatureWood® and MicroPro™/Smart Sense® wood preservatives are waterborne, copper-quat preservative systems used for wood members that are required by the applicable code to be protected against fungal decay or termites, or where such protection is desired.

NatureWood® and MicroPro™/Smart Sense® wood preservatives compositions are based on copper combined with a quaternary ammonium compound (quat). The ratio of copper, expressed as CuO , to quat is either 1:1 or 2:1, by weight. The quat component of MicroPro™/Smart Sense® is CARBO-NT®.

3.3 Wood Species:

NatureWood® (NW) and MicroPro™/Smart Sense® (MP/SS) wood preservatives are used to preservative-treat the following materials:

a. Dimensional lumber and timbers of the following species consisting of primarily sapwood: southern pine, ponderosa pine, red pine, radiata pine, German Scots pine and Caribbean pine.

b. Dimensional lumber and timbers of the following species consisting of primarily heartwood (NW only): Douglas fir, hem-fir, lodgepole pine, jack pine and redwood. MP/SS is allowed with incised hem-fir.

c. Lumber, of nominal size of 2-by-8 or less, for decking and specialty use of the species listed in (a) and (b), above.

d. Southern pine and Douglas fir plywood.

e. Round and sawn posts and building poles of southern pine, ponderosa pine, red pine, Douglas fir and hem-fir.

Species and minimum preservative retention levels are provided in Table 1 for NatureWood® (NW) treated wood, and in Table 2 for MicroPro™/Smart Sense® (MP/SS) treated wood.

4.0 INSTALLATION

4.1 General:

NatureWood® and MicroPro™/Smart Sense® preservative-treated wood is installed as preservative-treated lumber, timbers and plywood in accordance with the requirements of the applicable code.

Osmose, Inc., and industry-published installation instructions for wood and preservative-treated wood and this report must be strictly adhered to, and a copy of the instructions must be available at all times on the jobsite during installation.

The instructions within this report govern if there are any conflicts between Osmose, Inc., instructions and this report.

4.2 Applications:

NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products may be used in locations where wood is permitted and/or in locations required by the code to be fungal decay or termite resistant in all building types and occupancies as defined by the applicable code. Typical applications are listed in Table 3.

Locations requiring preservative-treated wood for fungal decay or termite resistance are described in Section 2304.11 of the IBC, and Sections R319 and R320 of the IRC.

4.3 Fasteners:

4.3.1 NatureWood® (NW): Fasteners used with NatureWood® preservative-treated wood products must be in accordance with Section 2304.9.5 of the IBC and Section R319.3 of the IRC. Aluminum fasteners and other aluminum building products (flashing, siding, etc.) must not be placed in direct contact with NatureWood® preservative-treated wood products.

4.3.2 MicroPro™/Smart Sense® (MP/SS): Fasteners used with MicroPro™/Smart Sense® preservative-treated wood products must be in accordance with Section 2304.9.5 of the IBC and Section R319.3 of the IRC. Aluminum fasteners and other aluminum building products (flashing, siding, etc.) may be placed in direct contact with MicroPro™/Smart Sense® preservative-treated wood products.

4.4 Structural:

4.4.1 Duration of Load: The maximum load duration factor allowed for NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products used for structural members is 1.6 in accordance with Section 2.3 of the American Forest & Paper Association (AF&PA), National Design Specification for Wood Construction (NDS).

4.4.2 Incising Factor: When treated wood products have been incised, the reference design values must be multiplied by the incising factor, Ci, in accordance with Section 4.3.8 of the NDS.

5.0 CONDITIONS OF USE

The NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Dimensional lumber designated for "Decking Use" must not be more than 2 inches (51 mm) thick or 8 inches (203 mm) wide.

5.2 Use of the preservative-treated wood is limited to the types of applications noted in Section 4.2 of this report.

5.3 Surface treatment of field cuts must be in accordance with the recommendations of Osmose, Inc.

5.4 NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products are limited to the wood species noted in Section 3.3 and the minimum retentions noted in Tables 1 and 2.

5.5 Treatment of wood products is at the facilities of the treaters noted in Table 4, under a quality control program with inspections by either Timber Products Inspection Inc. (AA-664 and AA-696) or Southern Pine Inspection Bureau, Inc. (AA-680).

6.0 EVIDENCE SUBMITTED

Data in accordance with Appendix B, Copper-quaternary and Copper-zinc Wood Preservative Treatment Systems (formerly AC78), of the ICC-ES Acceptance Criteria for Proprietary Wood Preservative Systems–Common Requirements for Treatment Process, Test Methods and Performance (AC326), dated February 2008.

7.0 IDENTIFICATION

NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products, lumber and plywood must be labeled with the name of the inspection agency (Timber Products Inspection Inc. or Southern Pine Inspection Bureau, Inc.); product name or logo (see Figure 1); the treatment company name and plant location (refer to Table 4); the name or designation of the preservative components; minimum retention; the intended end use; and the evaluation report number (ESR-1980). Sample labels are shown in Figure 1.

8.0 OTHER CODES

In addition to the codes referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following legacy codes and earlier editions of the International Codes:

- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IBC)
- 1997 *Uniform Building Code*™ (UBC)
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code*© (SBC)

The NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products described in this report comply with, or are suitable alternatives to what is specified in, the codes listed above, subject to the provisions of Sections 8.1 through 8.6.

8.1 Uses:

See Section 2.0.

8.2 Description:

See Section 3.0.

8.3 Installation:

See Section 4.0, except for the following modifications:

Locations requiring preservative-treated wood for decay or termite resistance are described in Section 2304.11 of the 2000 and 2003 IBC, Sections R323 and R324 of the 2000 IRC, Sections R319 and R320 of the 2003 IRC, Section 2304 of the SBC, Section 2311 of the BNBC, and Section 2306 of the UBC.

Fasteners used with NatureWood® and MicroPro™/Smart Sense® preservative-treated wood products must be in accordance with Section 2304.9.5 of the 2000 and 2003 IBC, Section R323.3 of the 2000 IRC, Section R319.3 of the 2003 IRC, Section 2306.3 of the SBC, Section 2311.3.3 of the BNBC, and Section 2304.3 of the UBC, except that aluminum fasteners are also permitted.

8.4 Conditions of Use:

See Section 5.0.

8.5 Evidence Submitted:

See Section 6.0.

8.6 Identification:

See Section 7.0.

TABLE 1—MINIMUM PRESERVATIVE RETENTION REQUIREMENTS AND SPECIES FOR NATUREWOOD® PRESERVATIVE-TREATED WOOD PRODUCTS BY END USE

NatureWood ® Minimum Retention (pcf)		Species listed in Section 3.3.a and 3.3.d							Species listed in Section 3.3.b and 3.3.d			
		Sapwood Species							Heartwood Species			
Service Condtion[3]	PCF[4]	Mixed Southern Pine Includes Plywood	Radiata Pine	Red Pine	Ponderosa Pine	Eastern White Pine	Caribbean Pine	German Scots Pine	Douglas-Fir Includes Plywood	Hem-Fir Includes Decking	Lodgepole Pine	Jack Pine
Above Ground Decking, Fencing	0.15	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA
Above Ground - General Use	0.20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ground Contact - General Use	0.40	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ground Contact - Critical Structures - Foundation Use	0.60	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	NA

[1]Retention is expressed in pounds of preservative per cubic foot (kilograms per cubic meter) of wood.
[2]Minimum actives retention expressed as CuO and quat.
[3]See Table 3 for description of Service Conditions.
[4]SI conversion: 1PCF = 16.02 kg/m^3.

TABLE 2—MINIMUM PRESERVATIVE RETENTION REQUIREMENTS AND SPECIES FOR MICROPRO™/SMART SENSE® PRESERVATIVE-TREATED WOOD PRODUCTS BY END USE

MicroPro ™ / SmartSense ® Minimum Retention (pcf)		Species listed in Section 3.3.a and 3.3.d						Section 3.3.b and 3.3.d	
		Sapwood Species						Heartwood Species	
Service Conditon[3]	PCF[4]	Mixed Southern Pine Includes Plywood	Radiata Pine	Red Pine	Ponderosa Pine	German Scots Pine	Caribbean Pine	Incised Hem Fir	Douglas-Fir Plywood
Above Ground Vertical Use Fence Boards and Pickets	0.10	✓	✓	✓	✓	✓	✓	✓	NA
Above Ground Decking, Fencing	0.15	✓	✓	✓	✓	✓	✓	✓	NA
Above Ground - General Use	0.15	✓	✓	✓	✓	✓	✓	✓	✓
Ground Contact - General Use	0.34	✓	✓	✓	✓	NA	✓	✓	✓
Ground Contact - Critical Structures - Foundation Use	0.60	✓	✓	✓	NA	NA	NA	NA	✓

[1]Retention is expressed in pounds of preservative per cubic foot (kilograms per cubic meter) of wood.
[2]Minimum actives retention expressed as CuO and quat.
[3]See Table 3 for description of Service Conditions.
[4]SI conversion: 1PCF = 16.02 kg/m^3.

TABLE 3—TYPICAL APPLICATIONS FOR NATUREWOOD® AND MICROPRO™/SMART SENSE® PRESERVATIVE-TREATED WOOD PRODUCTS

SERVICE CONDITIONS	AWPA USE CATEGORY	TYPICAL APPLICATIONS
Above ground - decking	—	Decking, rails, spindles, lattice, other specialties
Above ground - general use	UC3B	Decking, rails, spindles, trim and fascia, framing, flooring, sill plates, trellises, gazebos, fencing
Ground and freshwater contact – general use	UC4A	Deck support posts, fence posts, retaining walls, docks
Ground contact - critical structural	UC4B	Permanent wood foundations, sawn and round building poles

TABLE 4—WOOD PRESERVATIVE TREATMENT LOCATIONS

LISTEE	WOOD PRESERVATIVE TREATMENT LOCATIONS
Alabama-Georgia Wood Preservers, Co.	Lafayette, AL
Aljoma Lumber, Inc.	Medley, FL
Anthony Wood Treating, Inc.	Hope, AR
BB&S Treated Lumber of New England	North Kingstown, RI
Biewer of Lansing, LLC	Lansing, MI
Brackett Brothers Corp.	Morganton, NC
C.M Tucker Lumber Corp.	Pageland, SC
California Cascade Fontana, Inc.	Fontana, CA
Coastal Treated Products Co.	Weldon, NC Belington, WV Havana, FL Hopwood, PA Oxford, PA
Collum's Lumber Mill, Inc.	Allendale, SC
Colonie Wood Treating & Stain	Albany, NY
Columbus Lumber Company	Brookhaven, MS
Commercial Lumber Company	North Little Rock, AR
Commonwealth Wood Preservers, Inc.	Hampton, VA
Conasauga Wood Preservers	Conasauga, TN
Culpeper Wood Preservers	Shelbyville, IN
Davis Brothers' Lumber Company	Richland, SC
D & D Wood Preserving, Inc.	Albany, GA
Eastex Forest Products	Houston, TX
Elder Wood Preserving, Co.	Mansura. LA
Fortress Wood Products	Martinsville, VA Elizabeth City, NC Greensboro, NC
Perry Logistics dba Fortress Wood Products	Henderson, NC
Great Southern Wood Preserving	Abbeville, AL Conyers, GA Irvington, AL
Great Southern Wood-Tuscumbia, Inc.	Muscle Shoals, AL
Great Southern Wood-Bushnell, Inc.	Bushnell, FL
Great Southern Wood-Jesup, Inc.	Jesup, GA
Great Southern Wood-Columbus, Inc.	Columbus, TX
Great Southern Wood-Buckner, Inc.	Buckner, MO
Great Southern Wood-Glenwood, Inc.	Glenwood, AR
Great Southern Wood-Mt. Pleasant, Inc.	Mt. Pleasant, TX
Gulf Treating, Inc.	Mobile, AL
Hills Product Group	Whitewood, SD
Hixson Lumber Sales, Inc.	Magnolia, AR Caddo Hills, TX Hillsboro, IL Pine Bluff, AR Plumerville, AR Gilmer, TX Willis, TX Winnfield, LA
Hoover Treated Products	Thomson, GA Milford, VA Pine Bluff, AR Detroit, MI
Innovative Pine Technology/Lake States	Duluth, MN
John A. Biewer Company of Wisconsin	Prentice, WI
Land O Lakes Wood Preserving Co.	Tenstrike, MN
Land & Sea Forest Products	Fairless Hills, PA
MG Building Materials	San Antonio, TX

TABLE 4—WOOD PRESERVATIVE TREATMENT LOCATIONS (Continued)

LISTEE	WOOD PRESERVATIVE TREATMENT LOCATIONS
Maine Wood Treaters	Mechanic Falls, ME
Midwest Manufacturing	Eau Claire, WI
Midwest Manufacturing	Pioneer, OH
New South Wood Preserving, LLC	Camden, SC
New South Wood Preserving, LLC	Conway, SC
Potomac Supply Corporation	Kinsale, VA
Shenandoah Wood Preservers, Inc.	Scotland Neck, NC
Simmons Wood Products, Inc.	Albuquerque, NM
S.I. Storey Lumber Company	Armuchee, GA
Steinkamp Warehouse, Inc.	Huntingburg, IN
Straits Wood Treating	Bay City, MI
Thrift Brothers Lumber, Inc.	Westminster, SC
Thomas Wood Preserving Company	Elliott, MS
Tomball Forest Products	Waller, TX
TrueGuard, LLC	White City, OR Washougal, WA Loveland, CO Fort Collins, CO
Universal Forest Products	Grand Rapids, MI Moultrie, GA Union City, GA Gordon, PA Salisbury, NC Auburndale, FL Granger, IN Janesville, WI Belchertown, MA Windsor, CO Saginaw, TX Ranson, WV Harrisonville, MO Hamilton, OH Stockertown, PA Elizabeth City, NC Lodi, OH Schertz, TX New Waverly, TX Silsbee, TX Westville, IN Blanchester, OH White Bear Lake, MN Janesville-South. WI Lansing, MI
United Wood Preserving, LLC	Muscle Shoals, AL
Western Wood Preserving Co.	Sumner, WA
Western Wood Treating, Inc.	Woodland, CA
Wood Protection LP	Houston, TX

TABLE 5—LISTEES AND PRIVATE BRAND NAMES FOR EACH COMPANY FOR WOOD TREATED WITH NATUREWOOD® AND MICROPRO/™SMART SENSE® WOOD PRESERVATIVES

COMPANY	PRIVATE BRAND NAME	
Osmose, Inc.	**NatureWood®**	**MicroPro™/Smart Sense®**
Alabama-Georgia Wood Pres. Co.	Note 1	Note 1
Aljoma Lumber, Inc.,	Note 1	Note 1
Anthony Wood Treating, Inc.	Note 1	Note 1
BB&S Treated Lumber of New England	Note 1	Note 1
Biewer of Lansing, LLC	Note 1	Everguard
Brackett Brothers Corp.	Note 1	Note 1
C.M. Tucker Lumber corp.	Top Choice	Note 1
Coastal Treated Products Co.	Note 1	Note 1
California Cascade Fontana, Inc.	Note 1	Note 1
Collum's Lumber Mill, Inc.	Note 1	Note 1
Colonie Wood Treating & Stain	Note 1	Note 1
Columbus Lumber Co.	Note 1	Note 1
Commercial Lumber Company	Note 1	Note 1
Commonwealth Wood Preservers, Inc.	Note 1	Note 1
Conasauga Wood Preservers	Note 1	Note 1
Culpeper Wood Preservers	Note 1	Note 1
D & D Wood Preserving, Inc.	Note 1	Note 1
Davis Brothers' Lumber Company	Note 1	Note 1
Eastex Forest Products	Top Choice	Note 1
Elder Wood Preserving Co.	Note 1	Note 1
Fortress Wood Products	Note 1	Note 1
Perry Logistics dba Fortress Wood Products, Henderson, NC	Note 1	Note 1
Great Southern Wood Preserving	Yella Wood and Thompsonized	Yella Wood
Gulf Treating, Inc.	Note 1	Note 1
Hills Product Group	Note 1	Note 1
Hixson Lumber Sales	Top Choice	Note 1
Hoover Treated Products	Note 1	Note 1
John A. Biewer Company of Wisconsin, Inc.	Note 1	Note 1
Innovative Pine Technology/Lake States	XGUARD	Note 1
Land O Lakes Wood Preserving Co.	Note 1	Note 1
Land & Sea Forest Products	Top Choice	Note 1
MG Building Materials	Note 1	Note 1
Maine Wood Treaters	Note 1	Note 1
Midwest Manufacturing	AC2	AC2 MicroPro
New South Wood Preserving, LLC	Thompsonized and Top choice	Note 1
Potomac Supply Corp.	Great Deck and Top Choice	Note 1
S.I. Storey Lumber Co.	Note 1	Note 1
Shenandoah Wood Preservers, Inc.	Note 1	Note 1
Simmons Wood Products, Inc.	Note 1	Note 1
Steinkamp Warehouse, Inc.	Note 1	Note 1
Straits Wood Treating	Note 1	Note 1
Texas Forest Products	Note 1	Note 1
Thomas Wood Preserving Co.	Note 1	Note 1
Tomball Forest Products	Note 1	Note 1
Thrift Brothers Lumber, Inc	Note 1	Note 1
TrueGuard, LLC	All Weather Deck and Top Choice	All Weather Deck
Universal Forest Products	ProWood ACQ ProWood Dry Thompsonized and Top choice	ProWood Micro ProWood Microshades ProWood Dry
United Wood Preserving, LLC	Note 1	Note 1
Western Wood Preserving Co.	Note 1	Note 1
Western Wood Treating, Inc.	Note 1	Note 1
Wood Protection LP	Note 1	Note 1

[1]The private brand name shall be as noted for the report holder, Osmose, Inc.

NatureWood®

NatureWood
PRESERVED WOOD PRODUCTS

UC3B
Copper Quaternary Compounds
ABOVE GROUND

ESR-1980
MONITORED BY:
(INSPECTION AGENCY NAME)

WOOD TREATING COMPANY
CITY, STATE

NatureWood
PRESERVED WOOD PRODUCTS

UC4A
Copper Quaternary Compounds
GROUND CONTACT

ESR-1980
MONITORED BY:
(INSPECTION AGENCY NAME)

WOOD TREATING COMPANY
CITY, STATE

NatureWood
PRESERVED WOOD PRODUCTS

UC4B
Copper Quaternary Compounds
**GROUND CONTACT &
PERMANENT WOOD FOUNDATION**

KDAT

ESR-1980
MONITORED BY:
(INSPECTION AGENCY NAME)

WOOD TREATING COMPANY
CITY, STATE

NatureWood
PRESERVED WOOD PRODUCTS

Copper Quaternary Compounds
DECKING USE

ESR-1980
MONITORED BY:
(INSPECTION AGENCY NAME)

WOOD TREATING COMPANY
CITY, STATE

MicroPro® / Smart Sense®

Smart Sense® (MicroPro®)

Micronized Copper Quaternary Compounds
ABOVE GROUND

ESR-1980

Wood Treating Company
City, State

MONITORED BY:
(INSPECTION AGENCY NAME)

Smart Sense® (MicroPro®)

Micronized Copper Quaternary Compounds
GROUND CONTACT

ESR-1980

Wood Treating Company
City, State

MONITORED BY:
(INSPECTION AGENCY NAME)

Smart Sense® (MicroPro®)

Micronized Copper Quaternary Compounds
**GROUND CONTACT,
STRUCTURAL, &
PERMANENT WOOD FOUNDATION**
KDAT
ESR-1980

Wood Treating Company
City, State

MONITORED BY:
(INSPECTION AGENCY NAME)

FIGURE 1— SAMPLE PRODUCT LABELS
(Product must also be labeled with minimum retentions as specified in Tables 1 and 2)

Standard Method of Test for

Evaluation of Adhesive Anchors in Concrete Under Sustained Loading Conditions

AASHTO Designation: T XXXX-XX

ASTM Designation: XXXX-XX

INTRODUCTION

Adhesive anchor systems have widespread use in transportation structures such as bridge widening, concrete repair and rehabilitation, barrier retrofitting, utility installation on existing structures, and tunneling. These systems are used to anchor threaded rod and reinforcing bars in concrete. This test method determines an adhesive anchor's ability to withstand sustained tensile loads under normal conditions.

1 SCOPE

1.1 This test method applies to structures used in AASHTO applications and is applicable to adhesive anchor systems with steel anchors in predrilled holes in concrete.

1.2 This test method determines the time to failure for adhesive anchors in concrete at various levels of sustained loading.

1.3 The static load test is developed from ASTM E 488 and the sustained load (creep) test is modified from ASTM E 1512 and ICC-ES AC308.

1.4 This test method only addresses the effect of sustained loads on adhesive anchors. There are numerous other factors that affect the load capacity of adhesive anchors and a complete battery of tests is essential to evaluate an adhesive anchor. Refer to ICC-ES AC308 for a listing of some of the many factors and related test methods that apply to adhesive anchors.

2 REFERENCED DOCUMENTS

2.1 *ASTM Standards:*

A 193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications

C 31, Standard Practice for Making and Curing Concrete Test Specimens in the Field

C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C 42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

D 907, Standard Terminology of Adhesives

D 2990, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

E 488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

E 1512, Standard Test Methods for Testing Bond Performance of Bonded Anchors

2.2 *Other Standards:*

ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete

3 TERMINOLOGY

3.1 Refer to ASTM D 907 for a complete listing of terminology related to adhesives.

3.2 *Adhesive anchor* – a post-installed anchor that transfers load to concrete through an adhesive compound embedded in a hole in hardened concrete. The adhesive materials used include epoxy, cementitious material, polyester resin, and others.

3.3 *Creep* – the deformation or displacement of an adhesive over time due to stress.

3.4 *Embedment depth* – distance from the surface of the structural member to the end of the installed anchor.

3.5 *LVDT* – Linear Variable Differential Transformer; an electronic instrumentation device used for measuring displacement.

3.6 *Static load test* – a test in which a load is slowly applied at a specified rate for one cycle until failure.

3.7 *Sustained load (creep) test* – a test in which a constant load is continuously applied until failure due to creep.

3.8 *Symbols*:

d = nominal anchor diameter, in (mm)

d_o = nominal diameter of drilled hole in concrete, in (mm)

f'_c = specified compressive strength of concrete, psi (MPa)

h_{ef} = effective depth of embedment of an anchor, in (mm)

4 SIGNIFICANCE AND USE

4.1 Determination of mean static load of an adhesive anchor.

4.2 Determination of acceptable loads to apply to an adhesive anchor based on the lifetime of the structure.

4.3 Determination of an adhesive anchor's ability to endure sustained loads.

4.4 The Stress versus Time-to-Failure graph is useful to the practicing engineer in selecting and designing adhesive anchors.

4.5 A Stress versus Time-to-Failure graph can give an indication of the reduction in capacity of an adhesive anchor due to sustained load at a given design lifetime.

4.6 Means for comparing adhesive anchor products for sustained loading applications.

4.7 The test methods in this standard should be followed in order to ensure reproducibility of test results.

5 TEST APPARATUS

5.1 *Instrumentation and Data Collection:*

5.1.1 All laboratory instrumentation (electronic load, displacement, temperature, and humidity sensors, etc.) must be calibrated with certified equipment.

5.1.2 A load cell or other load measuring device must be able to measure forces to within ±1% of the anticipated peak load.

5.1.3 As an alternative, a load cell is not required for monitoring the sustained load (creep) test if the test apparatus has a stiffness that is sufficiently low to ensure accuracy of 1% of the applied sustained load at the maximum anchor creep displacement and a stiffness-displacement relationship can be established to determine the load applied with reasonable confidence.

5.1.4 Displacements should be measured continuously by LVDTs, linear potentiometers, or an equivalent device with an accuracy of at least 0.001 in. (0.025 mm).

5.1.5 The instrumentation must be placed in a way so as not to interfere with the anchor or testing apparatus. The instrumentation should measure the vertical displacement and load on the anchor relative to the test specimen. The instrumentation should be placed in such a way that it will remain parallel to the axis of the anchor and will not be affected by the deflection and/or failure of the anchor or test specimen.

5.1.6 Two displacement measuring devices shall be placed equidistant from the anchor and their values averaged to obtain the actual displacement. One displacement measuring device may be used if it is placed centered on the anchor's axis and can be shown to produce acceptable confidence.

5.1.7 *Static Load Test:* The measuring devices and the data collection system must be able to gather data points at least twice per second for the static load test.

5.1.8 *Sustained Load (Creep) Test:* The measuring devices and the data collection system must be able to gather data points according to a progressively reducing frequency as discussed in section 9.4.6.2 of this standard.

5.2 *Test Apparatus:*

5.2.1 Examples of suitable test apparatus for static and sustained load (creep) tests are shown in Figure 1 and Figure 2 respectfully.

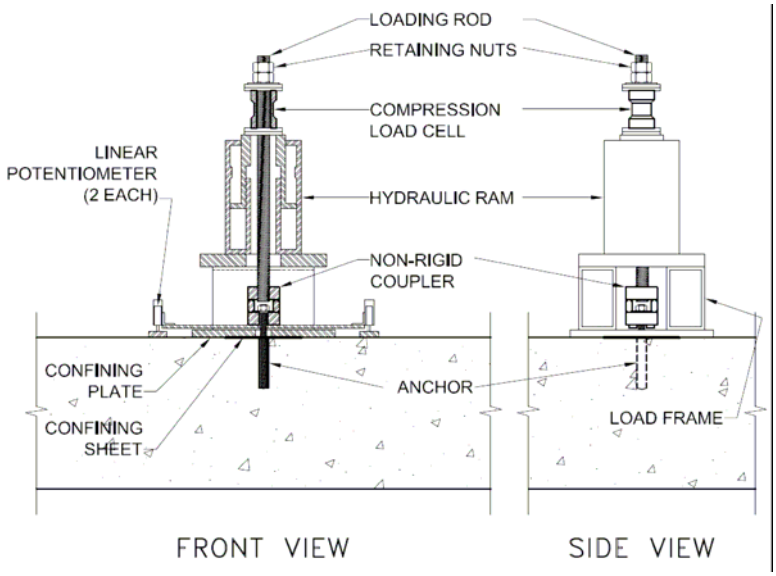

Figure 1: Static Load Test Apparatus

(Source: modified from Cook et al. [14.2])

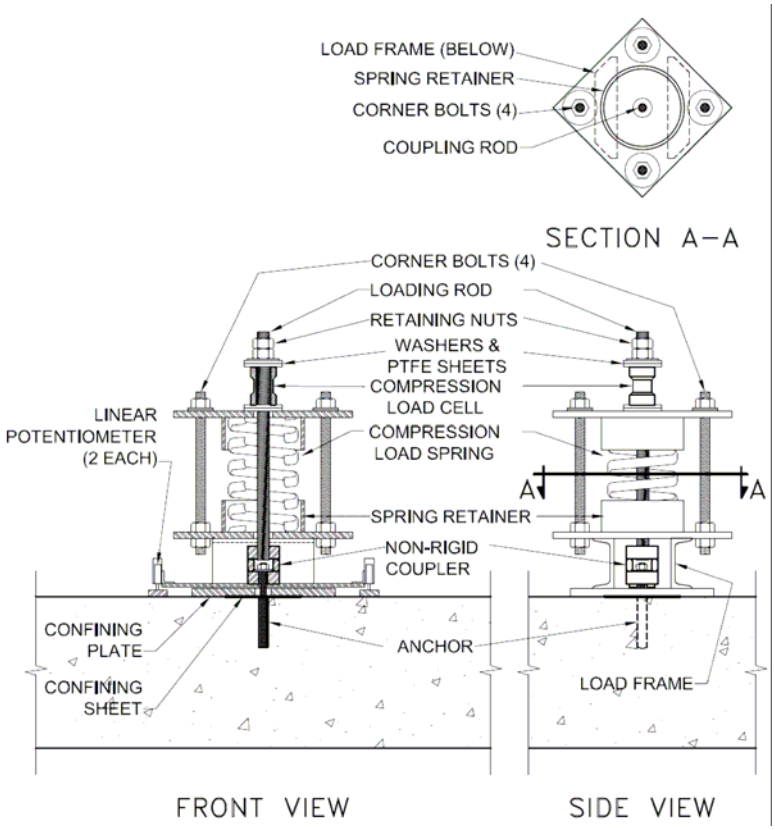

Figure 2: Sustained Load (Creep) Test Apparatus

(Source: modified from Cook et al. [14.2])

5.2.2 The test apparatus must be of sufficient capacity so as to not yield during testing.

5.2.3 *Coupler:* A coupler shall be used between the anchor and the test loading rod providing a non-rigid connection which does not transfer bending forces.

5.2.4 *Confining Plate:*

5.2.4.1 The thickness of the confining plate should be greater than or equal to the nominal anchor diameter ±1/16 in. (±1.5 mm).

5.2.4.2 In order to account for surface irregularities, a sheet of tetrafluoroethylene (TFE), polytetrafluoroethylene (PTFE), fluorinated ethylene propylene (FEP), or perfluoroalkoxy (PFA) of up to 0.06 in (0.15mm) of the same shape and dimensions of the confining plate shall be placed between the confining plate and the surface of the concrete.

5.2.4.3 The confining plate and the confining sheet shall be large enough that the pressure on the concrete underneath the plate does not exceed $0.40f'_c$.

5.2.4.4 The hole in the confining plate and the confining sheet shall be $1.5d_o$ to $2.0d_o$. The initial shape of the hole shall match the anchor's cross-section. The size and shape of the hole shall be maintained in all tests.

6 TEST SPECIMEN

6.1 *Anchorage System* - The anchorage system used in the tests should be representative of that used in the field.

6.2 *Anchor Placement* – Anchors shall be placed far enough apart so as to not interfere with the testing apparatus.

6.3 *Structural Member:*

6.3.1 The structural member used in the tests shall not have anchors located within $2h_{ef}$ of the edges and shall not cause early failure of the member or the anchor.

6.3.2 Reinforcing steel can be used but only what is necessary for handling and shall not interfere with the anchor. Reinforcing cannot be located within an imaginary cone projecting from the end of the embedded anchor to the loaded face of the structural member with an internal vertex angle of 120 degrees.

6.3.3 The depth of the structural member should be at least $1.5h_{ef}$ providing it is thick enough for installation and does not cause early failure of the member or the anchor.

6.3.4 The length and width of the structural member shall be large enough to ensure proper placement of the anchors in accordance with minimum spacing and edge distances.

6.3.5 The surface of the structural member shall be form-work or steel-trowel finish.

6.3.6 The concrete compressive strength at time of testing shall be from 2500 psi to 4000 psi (17 MPa to 28 MPa), unless otherwise specified. The aggregate should be of river gravel or crushed rock with a maximum aggregate size of ¾" or 1" (19mm or 24mm). The concrete mixture shall not include any materials such as blast furnace slag, fly ash, silica fume, limestone powder, or admixtures unless otherwise specified.

6.3.7 Cure the concrete for a minimum of 28 days ensuring proper moisture for hydration.

6.3.8 Concrete cylinders shall be made in accordance with ASTM C 31 and cured in similar conditions as the structural member. Cylinders shall be de-molded at the same time as form removal.

6.3.9 Test concrete compressive strength in accordance with ASTM C 39 for concrete cylinders or ASTM C 42 for concrete cores. Concrete strength at any point can be determined from a concrete strength-age relationship curve constructed from a sufficient number of compression tests conducted at regular intervals. It is also permitted, to linearly interpolate concrete strength from compression tests conducted at the beginning and end of a test series.

7 ADHESIVE AND ANCHOR INSTALLATION AND CURING

7.1 Prior to anchor installation, condition the test specimen to 75ºF ±10ºF (24ºC ±5ºC) and 50% ±10% relative humidity.

7.2 *Hole:*

7.2.1 Drill holes in accordance with the manufacturer's specifications and document any deviations. Drilled holes must be perpendicular (±6º) to the face of the concrete test specimen.

7.2.2 In order to more easily compare data – the embedment depth h_{ef} should be 4.5in. ±0.1in. (115mm ±2.5mm) unless otherwise specified. A shallower embedment depth may be used if it is determined that a steel failure would occur prior to bond failure.

7.2.3 For anchors with a diameter *d* the minimum embedment depth h_{ef} shall conform to Table 1.

Table 1: Minimum Embedment Depth

d	$h_{ef,min}$
1/2"	2 3/4"
5/8"	3 1/8"
3/4"	3 1/2"
≥ 1"	4d

7.2.4 Clean the holes in accordance with the manufacturer's specifications and document any deviations.

7.3 *Adhesive:*

7.3.1 Prepare and install the adhesive in accordance with the manufacturer's specifications and document any deviations.

7.3.2 Cure the adhesive according to the manufacturer's specifications and document any deviations.

7.4 *Anchor:*

7.4.1 Install the anchor in accordance with the manufacturer's specifications and document any deviations.

7.4.2 To ensure bond failure, use a high-strength steel (minimum strength equivalent to ASTM A 193 Grade B7).

7.4.3 In order to more easily compare data, anchors shall be 5/8" – 11 UNC (16mm) threaded rod unless otherwise specified. A larger anchor diameter may be used if it is determined that a steel failure would occur prior to bond failure.

8 SPECIMEN CONDITIONING

8.1 Begin conditioning of the test slabs to their final environmental condition upon completion of the manufacturer's specified curing time, and within 7 ±5 days.

8.2 Do not begin tests until the temperature and humidity of the test specimens have stabilized for at least 24 hours.

Note 1 – Depending on the size of the structural member it might take several days to raise and stabilize the concrete temperature to the final elevated temperature.

9 TEST PROCEDURE

9.1 The test procedure consists of two types of tests (Static Load Test and Sustained Load (Creep) Test). Static load tests are conducted initially to determine the *mean static load*. Subsequently, several sustained load (creep) tests are conducted at various percentages of the *mean static load*.

9.2 *General Requirements:*

9.2.1 All tests will be confined tests.

9.2.2 The tests will be conducted at specified temperature and humidity. The temperature shall be monitored via thermocouples or temperature sensors placed in the concrete test specimen. The thermocouples or temperature sensors can be either cast-in-place or installed in a maximum ½ in. (12mm) diameter hole and sealed to ensure accurate concrete temperature readings. The thermocouples or temperature sensors should ideally be placed at the mid-depth of the anchor but not deeper than 4.5 in. (114mm).

9.2.3 Alternatively, the temperature can be monitored daily by a temperature sensor located in the test chamber if a confident correlation can be shown between test chamber temperature and test specimen concrete temperature.

9.3 *Static Load Test:*

9.3.1 *Environmental Conditions* – Conduct the static load tests at a minimum temperature of 110ºF +10ºF/-0ºF (43ºC +5ºC/-0ºC) and below 40% relative humidity. Following the required adhesive curing time, raise the temperature to the minimum elevated temperature of 110ºF (43ºC). Do not begin testing until the temperature and humidity of the test specimen have stabilized for at least 24 hours.

9.3.2 *Number of Test Specimens* – A minimum of five (5) anchors shall be tested and their results averaged.

9.3.3 *Test Setup:*

9.3.3.1 Ensure that the test apparatus and instrumentation complies with the requirements of section 5 of this test method.

9.3.3.2 Ensure that the test apparatus is centered over the anchor and that the force applied is acting through the center of the anchor and perpendicular to the structural member.

9.3.3.3 Place the confining sheet around the anchor as discussed in section 5.2.4.2 of this standard.

9.3.3.4 Place the confining plate over the confining sheet assuring that there is full bearing with the structural member around the anchor.

9.3.3.5 Connect the loading rod to the anchor by means of a non-rigid connecting coupler and ensure that it is acting in-line with the anchor.

9.3.3.6 The amount of pre-tensioning to the apparatus during test setup shall be uniform for all samples.

9.3.4 *Loading:*

9.3.4.1 *Initial Load* – Apply an initial load not exceeding 5% of the estimated ultimate load capacity of the anchor system in order to bring all members of the test apparatus into bearing. Zero the displacement readings.

9.3.4.2 *Rate of Loading* – Two loading rates are allowed by ASTM E 488, the Continuous Load Rate and the Incremental Load Rate. The continuous load rate is the only load rate allowed in this test method for the calculation of *mean static load* and for inclusion in the Stress versus Time-to-Failure graph.

Note 2 - The incremental load rate can be used in optional additional tests as a method to (1) provide an indication of an adhesive's displacement sensitivity to load at the higher stress levels and (2) determine appropriate stress levels to test at for the sustained load (creep) tests. This method is discussed in further detail in Appendix X1.

9.3.4.2.1 *Continuous Load Rate* - Apply a uniform load rate such that failure will ideally occur at 2-min. Failure shall not occur in less than 1-min or greater than 3-min.

9.3.4.2.2 *Incremental Load Rate* - Apply the load in steps with the first increment not greater than 50% and each increment thereafter not exceeding 15% of the total expected load. Maintain each load increment within a tolerance of ±2% for 2 minutes.

9.3.5 *Data Collection* – Collect load and displacement readings according to section 5.1.7 of this standard.

9.3.6 *Determination of Failure* – See Appendix X2 for a description of the various failure modes and methods to determine static load strength.

9.3.7 *Calculations:* Determine and record the *mean static load* by averaging the individual static load strengths from each test series.

9.4 *Sustained Load (Creep) Test:*

9.4.1 *Environmental Conditions* – Conduct the sustained load (creep) tests at a minimum elevated temperature of 110ºF +10ºF/-0ºF (43ºC +5ºC/-0ºC) and below 40% relative humidity. Following the required curing time, raise the temperature to the minimum elevated temperature of 110ºF (43ºC). Do not begin the test until the temperature and humidity of the test specimen has stabilized for at least 24 hours.

9.4.2 *Test Series* – Conduct a minimum of two series of sustained load (creep) tests within two load ranges (PL1 and PL2) based on the *mean static load* from the static load test:

9.4.2.1 Percent load level range 1 (PL1) is suggested to be between 70% and 80% of *mean static load*.

9.4.2.2 Percent load level range 2 (PL2) is suggested to be between 60% and 70% of *mean static load*.

9.4.2.3 It is not necessary that all test specimens be tested at the same percent load level, but that they lie within the ranges and the averages of the two test series should vary by at lest 10%.

9.4.3 *Number of Test Specimens* – A minimum of five (5) anchors per series shall be tested.

9.4.4 *Test Setup:*

9.4.4.1 Ensure that the test apparatus and instrumentation complies with the requirements of section 5 of this test method.

9.4.4.2 Ensure that the test apparatus is centered over the anchor and that the force applied is acting through the center of the anchor and perpendicular to the structural member.

9.4.4.3 Place the confining sheet around the anchor as discussed in section 5.2.4.2 of this standard.

9.4.4.4 Place the confining plate over the confining sheet assuring that there is full bearing with the structural member around the anchor.

9.4.4.5 Connect the loading rod to the anchor by means of a non-rigid connecting coupler and ensure that it is acting in-line with the anchor.

9.4.4.6 The amount of pre-tensioning to the apparatus during test setup shall be uniform for all samples.

9.4.5 *Loading* – Apply an initial load not exceeding 5% of *mean static load* in order to bring all members of the test apparatus into bearing. Zero the displacement readings. Apply the remainder of the sustained load within 2-min ±1-min in as smooth a manner as possible.

Note 3 – A suggested modification to the sustained load (creep) test apparatus shown in Figure 2 is presented in Appendix X4 to provide for smooth load transfer.

9.4.6 *Data Collection:*

9.4.6.1 *Temperature* - Record the concrete specimen temperature at a maximum 1-hour interval. Alternatively, the concrete specimen temperature can be recorded at 24-hour intervals if the test chamber temperature is recorded at 1-hour intervals.

9.4.6.2 *Displacement* – The frequency of displacement readings can be reduced over time.

Note 4 - The following schedule is a suggestion: every three seconds during loading, every minute for the first hour following loading, every ten minutes for the next nine hours, and every hour thereafter.

9.4.7 *Determination of Failure:* Failure for the sustained load (creep) test will be determined as the onset of tertiary creep. A discussion of tertiary creep and a method to determine its onset can be found in Appendix X3.

9.4.8 *Calculations* - Determine and record the time to failure and load level at failure for each specimen.

10 CALCULATIONS AND INTERPRETATION OF RESULTS

10.1 Determine the five individual static load strengths from each static load test. Methods to determine the static load strength can be found in Appendix X2.

10.2 Determine the *mean static load* by averaging the individual values from the static load tests.

10.3 Determine the time to failure for each sustained load (creep) test series as the initiation of tertiary creep. A procedure to locate the onset of tertiary creep can be found in the Appendix X3.

10.4 Determine the failure load level for each sustained load (creep) test series at the initiation of tertiary creep.

10.5 Normalize the load levels for the sustained load (creep) test to a percent of the *mean static load* from the static load tests.

10.6 Plot the normalized values from the static load test and the sustained load (creep) test on a Stress versus log of Time-to-Failure graph.

10.7 Extend a linear trendline through the fifteen points plotted.

10.8 A Stress versus Time-to-Failure graph can give an indication of the reduction in capacity of an adhesive anchor due to sustained load at a given design lifetime.

11 REPORT

11.1 Data Collection: Report the type of test (static load or sustained load) and the following applicable information:

11.1.1 Date of test and date of report.

11.1.2 Test sponsor and test agency.

11.1.3 Anchor information: manufacturer, model, type, material, finish, shape, dimensions, and other relevant information.

11.1.4 Adhesive information: manufacturer, model, type, lot, material, application method, and other relevant information.

11.1.5 Structural member information: description, dimensions, reinforcing, mix design of concrete, aggregate type, curing method, strength at time of test, age of concrete at time of test.

11.1.6 Installation information: description of the procedure, tools, and methods used to install the adhesive anchor. Include the drilling and cleaning of the holes as well as the installation of the adhesive and anchor. Document any deviations from the manufacturer's specifications.

11.1.7 Adhesive curing information: temperature and humidity conditions, length of cure, time when conditioning of test specimen began.

11.1.8 Temperature and humidity conditions at time of installation, and during adhesive cure, conditioning, and final testing.

11.1.9 Embedment depth and diameter of hole of installed anchors.

11.1.10 Test information: description of test method, amount of initial load, and actual rate of loading.

11.1.11 Number of samples tested per series.

11.1.12 Static Load Test Data:

11.1.12.1 Individual and average load values per anchor and COV.

11.1.12.2 Individual and average displacement values at maximum load

11.1.12.3 Load versus displacement curves per anchor.

11.1.12.4 Load versus time curves per anchor.

11.1.13 Sustained Load (Creep) Test Data:

11.1.13.1 Individual time-to-failure values per anchor.

11.1.13.2 Individual load values and percent *mean static load* values at failure per anchor.

11.1.13.3 Individual displacement values at failure per anchor.

11.1.13.4 Load versus displacement curves per anchor.

11.1.13.5 Displacement versus time curves per anchor.

11.1.13.6 Load versus time curves per anchor.

11.1.13.7 Stress versus Time-to-Failure curve.

11.1.14 Photographs, sketches and descriptions of failure modes observed.

11.1.15 Summary of findings

11.1.16 Listing of observers of tests and signatures of responsible persons.

12 PRECISION AND BIAS

12.1 *Precision* – No precision has been established for this test method.

12.2 *Bias* – No bias can be established because no reference material is available for this test.

13 KEYWORDS

13.1 adhesive anchors: anchors: bonded anchors: creep test: concrete: post-installed anchors: static load test: sustained load test: test methods: time to failure test

14 REFERENCES

14.1 Cook, R. A., and R. C. Konz. Factors Influencing Bond Strength of Adhesive Anchors. *ACI Structural Journal*, Vol. 98, No. 1, 2001, pp. 76-86.

14.2 Cook, R. A., R. C. Konz, and D. S. Richardson. *Specifications for Adhesive-Bonded Anchors and Dowels*. Report No. 96-3, University of Florida, Gainesville, FL, 1996.

APPENDIXES

(Non-mandatory Information)

X1 INCREMENTAL LOAD RATE

X1.1 As discussed in 9.3.4.2.2 the incremental load rate is a method that applies the load in several load steps and holds the load for two minutes and then increases to the next load level.

X1.2 This method can provide an indication of an adhesive's sensitivity to sustained loading at higher load levels.

X1.3 Figure 3 shows a load versus displacement curve and a time versus displacement curve for an anchor under incremental loading.

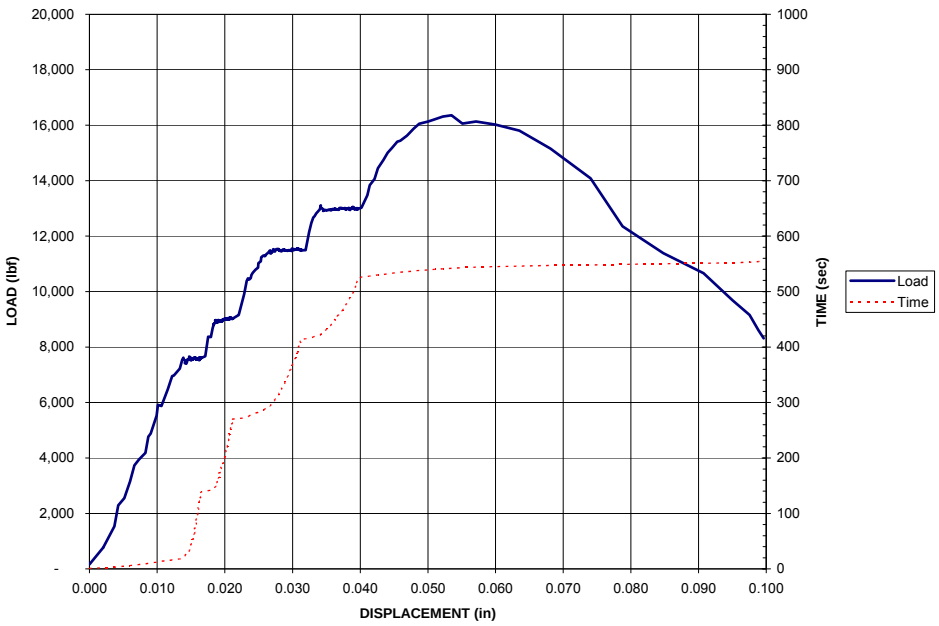

Figure 3: Load-Displacement and Time-Displacement Curves with Incremental Loading

X1.4 As shown in Figure 3, as the load is held constant, the anchor in this graph displays more displacement at the higher load steps.

X1.5 Figure 3 also shows that at the lower load levels, the displacement will tend to stabilize. Additionally, at the higher load levels, the anchor will continue to displace. This is indicated by the slope of the time-displacement curve.

X2 DETERMINING STATIC LOAD STRENGTH

X2.1 Cook and Konz [14.1] classify three types of load-displacement response (strength-controlled, stiffness-controlled, and displacement-controlled) for adhesive anchor systems. These three types of responses and methods of their analysis are summarized below:

X2.2 *Strength-controlled.* This failure mode is defined by a very sharp peak in the load-displacement curve. There is a drastic reduction in the stiffness of the adhesive anchor beyond the peak. The static load strength is determined to be at the peak on the load-displacement graph. Figure 4 shows a typical curve of a strength-controlled failure.

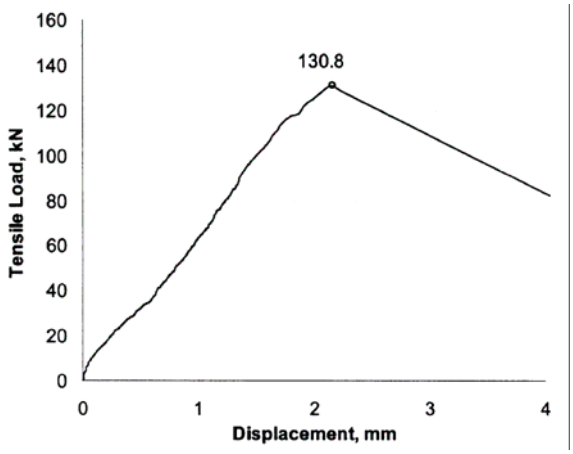

Figure 4: Typical Strength-controlled Failure

(Source: Cook and Konz [14.1])

X2.3 *Stiffness-controlled.* This failure mode is defined by a large initial stiffness and a drastic change in stiffness, which does not decrease but rather continues to increase at a lower slope. Due to the lack of "peak" in the curve, the static load strength is determined by finding the point at a tangent stiffness of 30 kip/in (5 kN/mm). The tangent stiffness (slope) at a given data point can be approximated by calculating the slope between a point five data points after and five data points before. Figure 5 shows a typical curve of a stiffness-controlled failure.

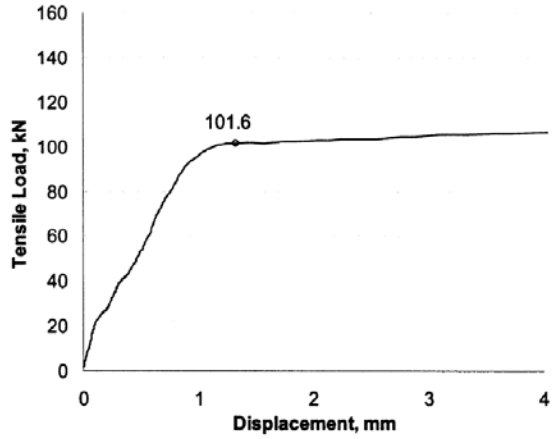

Figure 5: Typical Stiffness-controlled Failure

(Source: Cook and Konz [14.1])

X2.4 *Displacement-controlled.* This failure mode has a load-displacement curve with a relatively constant stiffness above the stiffness-controlled threshold of 30 kips/in. The maximum load occurs at very high, and impractical, displacements. In this case, the static load strength is set at a point with a displacement of 0.1 in (2.5mm). Figure 6 shows a typical curve of a displacement-controlled failure.

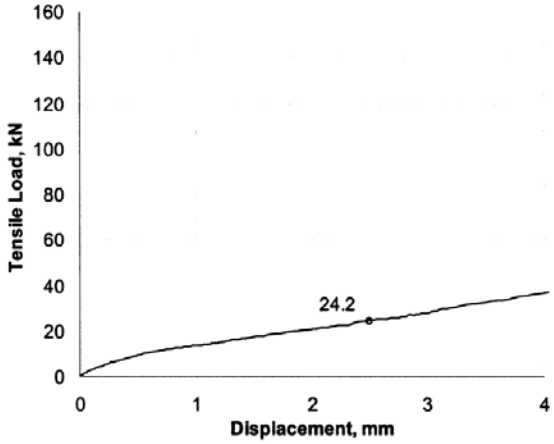

Figure 6: Typical Displacement-controlled Failure

(Source: Cook and Konz [14.1])

X3 DETERMINING ONSET OF TERTIARY CREEP

X3.1 As discussed in the appendix of ASTM D2990, the displacement versus time curve will display three regions. Region 1 is the primary creep region and is characterized by an initial rapid decrease in the creep rate. Region 2 is the secondary creep region and is characterized by a relatively steady slope. Region 3 is the tertiary creep region and is characterized by a rapid increase in creep ending in rupture. Figure 7 shows these three regions for a hypothetical sample.

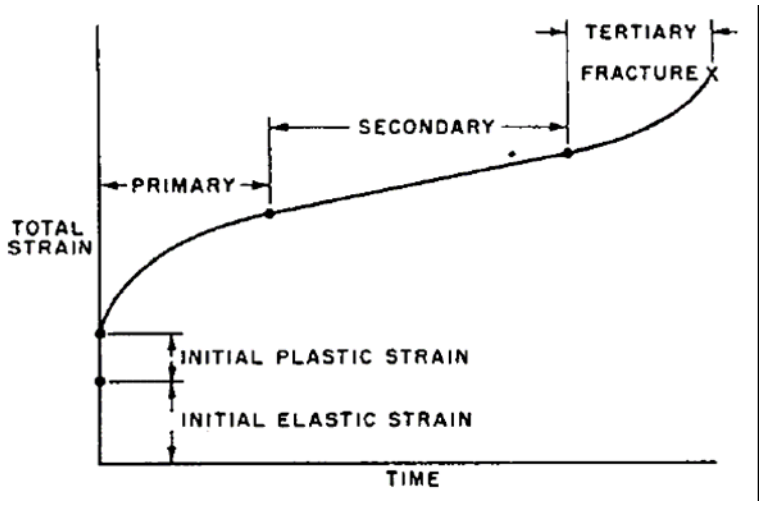

Figure 7: Regions on the Creep Curve

(Source: ASTM D 2990-01)

X3.2 The onset of tertiary creep is found by analyzing the change in the slope of the creep curve:

X3.2.1 This method calculates the slope at a given point as the slope between itself and the prior data point.

X3.2.2 The change in slopes between the given point and the following data point is plotted and examined over the region just prior to rupture. It is suggested that this examination be conducted on a normal graph (not log time). The rupture point is easily identified on the displacement vs. time graph. A suggested range for examining the change in slope is from 80% to 100% of time to rupture. Due to minor fluctuations in the displacement readings, the slope might change from positive to negative several times over this range.

X3.2.3 Tertiary creep is defined as the time the change in slope become positive for the last time prior to rupture. Figure 8 shows a sample graph for determining the initiation of tertiary creep.

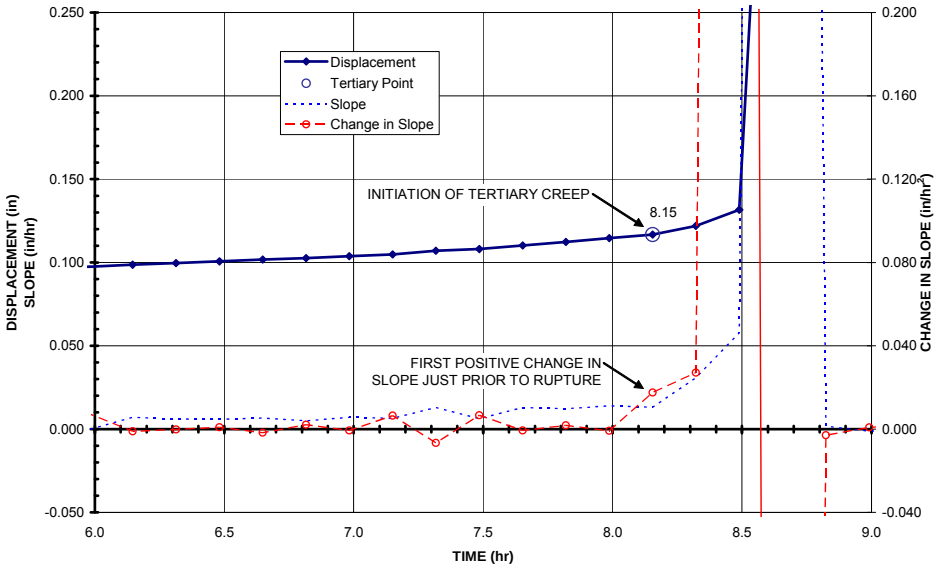

Figure 8: Sample Graph Showing Initiation of Tertiary Creep

X3.3 Failure for the sustained load is defined as the initiation of tertiary creep. The failure point for each sustained load test is plotted on the Stress versus Time-to-Failure graph. Figure 9 shows a sample Stress versus Time-to-Failure graph.

X3.4 A Stress versus Time-to-Failure graph can give an indication of the reduction in capacity of an adhesive anchor due to sustained load at a given design lifetime.

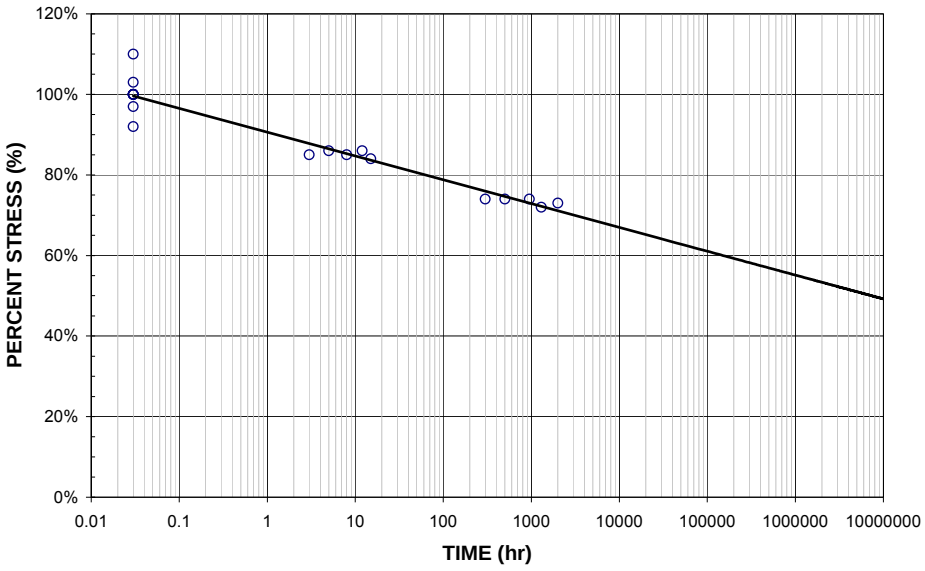

Figure 9: Sample Stress vs. Time-to-Failure Graph

X4 SUGGESTED SUSTAINED LOAD (CREEP) TEST APPARATUS FOR SMOOTH LOAD TRANSFER

X4.1 It is important that the load to the anchor be applied in a smooth manner. This can be accomplished with a hydraulic ram.

X4.2 Figure 10 shows a modified test apparatus for the sustained load (creep) test incorporating a hydraulic ram that reacts against a plate connected to the existing test apparatus by means of four threaded couplers. The ram and the upper plate can be removed following tightening of the loading rod nut.

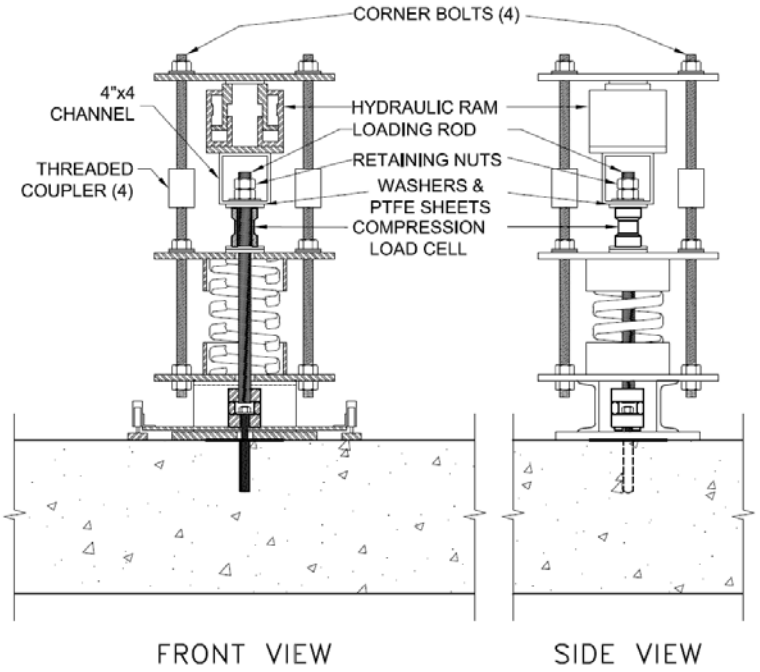

Figure 10: Suggested Load Transfer for Sustained Load (Creep) Tests

(Source: modified from Cook et al. [14.2])

Suggested Marking Change to M 284, Epoxy Coated Rebar by Matt Mueller Illinois

-----Original Message-----
From: Alan Rawson
Sent: Thursday, January 29, 2009 10:35 AM
To: Matt Mueller (E-mail)
Cc: David R. Hall (E-mail); Keith M. Platte (E-mail)
Subject: FW: FW: marking of reinforcing bars

Hi Matt,

Robert Sarcinella (Sarc), Texas, suggested that we run this by CRSI to get their input on your suggestion. Sarc believes that what we have is adequate. He is the lead person for the NTPEP rebar manufacture ring plant audit program.

If you would like I could send your suggestion out to the list serve for comment? Please let me know your thoughts.

Alan

-----Original Message-----
From: Robert Sarcinella [mailto:RSARCIN@dot.state.tx.us]
Sent: Wednesday, January 28, 2009 3:04 PM
To: Alan Rawson
Subject: RE: FW: marking of reinforcing bars

Sure, as long as I am correct with how IllDOT sees it. This was the story (the best that I could put together) based upon discussions with IllDOT, the producing mill, the applicator, CRSI and others.

Sarc.

>>> "Alan Rawson" <ARawson@dot.state.nh.us> 1/28/2009 2:01 PM >>>

Thanks Sarc. Can I share this with others including Illinois?

-----Original Message-----
From: Robert Sarcinella [mailto:RSARCIN@dot.state.tx.us]
Sent: Wednesday, January 28, 2009 2:27 PM
To: Alan Rawson
Subject: Re: FW: marking of reinforcing bars

Alan,

Sorry I took so long to get back on this (I have been may places in a short time). I can see some benefit of this, however I am not sure

this additional step buys us that much. Let me give you some background (you may or may not know this):

- Illinois DOT was having problems with epoxy coated A615 bar breaking during the bending process during fabrication.

- They believed the problem was related to the heating process (induction heating coil) associated with the epoxy coating process.

- They switched to A706 bar and that seemed to fix their problem. They only allow A706 steel now.

Some curious side notes to this situation were:

- They dealt with only one epoxy applicator

- They were dealing with only one bar producing mill

- Other DOT's I contacted (along with TxDOT) were not seeing this phenomenon. We all still spec. A615 steel.

I personally feel that this was an isolated incident and that the current identification process gives us what we need. I do not see that much of a benefit for the expense that the Applicators would need to incur. I would much rather float this idea through CRSI who maintains the audit program for Applicators. I would also like to incorporate the CRSI program into the NTPEP Panel as the audit program for epoxy coated reinforcement.

Hope this helps. If you need more info, please call me at (512) 506-5933.

Sarc.

>>> "Alan Rawson" <ARawson@dot.state.nh.us> 1/5/2009 12:53 PM >>>
Hi Sarc,

Matt Mueller, of Illinois DOT, is wondering if additional info on a rebar might be helpful to testing agencies and the NTPEP rebar program which you chair. Illinois had some recent rebar failures that brought this to light. Please read Matt's email below and take a look at the attachment. The illustration is an example of how the additional info might appear on a rebar. I would like to hear your opinion on Matt's suggestion and then decide whether I should send this to the Subcommittee on Materials list serve for further comment.

Hope you are doing well.
Thanks,
Alan

-----Original Message-----
From: Mueller, Matthew W [mailto:Matthew.Mueller@illinois.gov]
Sent: Tuesday, December 30, 2008 4:01 PM
To: Alan Rawson
Cc: Hughes, Edward E
Subject: marking of reinforcing bars

Alan,

Ed Hughes, our Metals and Misc Products Coordinator here at the Illinois DOT, has been working with the epoxy coaters that supply to our state to improve the quality of the product that comes out on jobsites. Due to recent past rebar failures, we had requested a significant amount of documentation in our attempt to track rebar from the mill, through the epoxy coaters, the supply houses, contractors and finally to the job site. The attached image shows what one of the coaters set up to demo what they could do to mark bars. In theory, there is no limit to the information that could be supplied, so coating dates could be added to English and metric sizes, rebar manufacturer, heats, lots, etc. We are told a single marking station set-up would cost ~$25k. I am sure this is coater/facility dependent.

I am sending this on to you to see if you think there would be national/regional interest. As we all consider the expansion of NTPEP to supplant state inspectors, I think there could be great benefit in tracking materials that move beyond state boundaries.

<<DSC01258.JPG>>

Let me know if you need any additional information or would like to discuss this further.

Matt Mueller

IDOT, Engineer of Tests

217-782-4423

Matthew.Mueller@illinois.gov

TECHNICAL SECTION 4C STANDARDS

State	AASHTO Standard	ASTM Standard	Standard Category	Title	Reconfirm Year
	M 133-07		A	Preservatives and Pressure Treatment Processes for Timber	2011
	M 143-03 (2007)	C 632-01	C	Sodium Chloride	2011
	M 144-07	D 98-05	C	Calcium Chloride	2011
	M 200-73 (2007)		A	Epoxy Protective Coatings	2011
	M 224-91 (2009)		A	Use of Protective Sealers for Portland Cement Concrete	2013
	M 233-86 (2009)		A	Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete	2013
	M 235M/M 235-03 (2007)	C 881-99	B	Epoxy Resin Adhesives	2011
	M 237-96 (2005)		A	Epoxy Resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement and Asphalt Concrete	2009
	M 247-07		A	Glass Beads Used in Traffic Paints	2011
	M 248-91 (2007)		A	Ready-Mixed White and Yellow Traffic Paints	2011
	M 249-98 (2007)		A	White and Yellow Reflective Thermoplastic Striping Material (Solid Form)	2011
	M 284M/M 285-06	A775/A775M-04a	C	Epoxy Coated Reinforcing Bars; Materials and Coating Requirements	2009
	M 300-03 (2007)		A	Inorganic Zinc-Rich Primer	2011
	M 317/M317-03 (2007)	D3963/D3963M-01	C	Epoxy-Coated Reinforcing Bars: Handling Requirements for Fabrication and Job Site	2011
	T 143-04 (2009)	D 345-02	C	Sampling and Testing Calcium Chloride for Roads and Structural Applications	2013
	T 237-05		A	Testing Epoxy Resin Adhesive	2009
	T 250-05		A	Thermoplastic Traffic Line Material	2009
	T 333-07		A	Linear Coefficient of Shrinkage on Cure of Adhesive Systems	2011
	T 337-09		A	Non-Instrumental Determination of Metallic Zinc in Zinc-Rich Primers	2013
	T 338-09		A	Analysis for Hindered Amine Light Stabilizer (HALS)	2013
	T 339-09		A	Analysis of Structural Steel Coatings for Isocyanate Content	2013
	R 31-07		A	Evaluation of Coating Systems with Zinc-Rich Primers	2011